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Exploring Aspects of the State of Competition in the EU

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Final report

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Abstract

There is growing evidence that over the past few decades competition across markets in the EU may have weakened: industry concentration and markups appear to have increased, while the gap between market leaders and followers seems to have widened and business dynamism seems to have declined. Against this background, this report investigates four important aspects of the state of competition in the EU. First, six sectoral cross-country price-concentration studies provide qualitative and, for mobile telecoms and airlines, empirical evidence that higher concentration seems to be associated with higher prices. Secondly, an analysis of the evolution of 'Global Superstars' (i.e. the most profitable of the world's largest firms) finds that their profit rates have increased significantly over the last 25 years, and that the distribution of profits has become more skewed. We also study how Global Superstars in the IT, pharma and consumer goods sectors are protected by barriers to entry. Thirdly, a survey of EU-based exporting firms suggests that effective domestic competition within the Single Market (i) is an important driver of their global export competitiveness (in particular effective competition in upstream goods markets) and (ii) is for a majority of respondents not constraining their scale in a way which would prevent them from being successful on global export markets. Finally, relying on own estimates of markups for 117,000 firms from 23 EU Member States and a general equilibrium macroeconomic model, we estimate based on three simulation scenarios that more effective competition across markets in the EU would likely contribute significantly to more investment, employment, productivity and increase GDP by more than 2% and 4% after 5 and 10 years respectively.

Executive summary

A consortium comprising Lear, E.CA Economics, Fideres, Prometeia, the University of East Anglia and Verian (hereinafter, collectively, the "Project Team"), and led by Lear, has been appointed by the Directorate-General for Competition of the European Commission to carry out a study to provide factual evidence on certain aspects of the state of competition in the EU and to estimate the cost of non-competition to the wider economy.

Competition is a dynamic process of rivalry in which firms vie for market demand. When effective, this process usually leads to better outcomes for customers. A greater level of competitive intensity in a market compels firms to compete more fiercely for customers: this can manifest in various ways depending on the market, including driving prices down, enhancing product quality, increasing variety to better meet the needs of customers, and introducing incremental and/or disruptive innovation. Effective competition has been shown to contribute to productivity, investment, innovation and ultimately growth.

The background to the study is an emerging economic literature that has in recent years documented that many advanced economies have experienced a deterioration in certain indicators of competition, and in various measures of economic performance that are related to the state of competition. In particular, the literature suggests that: concentration at sector level seems to have increased; markups have increased, especially for the firms at the top of the markup distribution; business dynamism has decreased; and market structures may have become more asymmetric, both in terms of firms' size and in terms of firms' markups. Chapter 1 of this report reviews this literature and concludes that, while none of the above indicators by itself is perfect, taken all together they suggest that competition has likely weakened across markets in EU.

Against this background, this report investigates four important aspects of the state of competition in the EU. Chapter 2 undertakes six sectoral cross-country price-concentration studies that provide qualitative and, for mobile telecoms and airlines, empirical evidence that higher concentration seems to be associated with higher prices. Chapter 3 studies the evolution of "Global Superstar firms" (i.e. the world's most profitable large firms), describing their profitability and the barriers to entry that protect their leading market position. Chapter 4 explores the role that domestic competition plays in determining the competitiveness of European firms in export markets, also by means of a survey among EU-based exporting firms. Chapter 5 estimates markups of 117,000 firms from 23 Member States to simulate how GDP growth, employment investment, exports and other macro-economic indicators would be impacted by more effective competition across markets in the EU. The main findings of each chapter are described below.

Market or industry concentration are among the most widely used indicators of competition, which in turn affects market outcomes, and notably prices: based on this premise, chapter 2 aims at assessing the role of concentration in explaining observed differences in prices across Member States in specific sectors of economic activity. We note, indeed, that, after more than 50 years of governmental efforts to create a single European market, a surprisingly large number of products exhibit a relevant degree of price heterogeneity across countries in the EU. Such price differences are not an indication that the single market policy has not worked, but rather they suggest that many factors that affect prices vary across Member States. These factors include differences in costs, taxes, regulation and – most importantly for the present study – the degree of competition (which in this chapter is proxied by various indicators of market concentration).

The influence of market concentration on prices is generally confirmed by the theoretical and empirical literature: several studies suggest that an increase in concentration is associated with higher prices, other things being equal. The literature, however, also warns that simple correlations between price and concentration are not sufficient to establish a compelling causal relationship between the two, and that more sophisticated empirical analyses would be warranted for this purpose.

To explore the role of various sources of outcome variation (whether price or quality) across Member States – and, notably, to investigate the role that concentration plays in determining them – we select six sectors of economic activity for further examination: mobile telecom, airlines, beer, mortgages, modern consumer retail and cement. These

sectors, which include both business-to-consumer and business-to-business activities, were selected due to their relevance to the economy and because they are characterized by relevant price differences across Member States. For mobile telecoms and airlines, we perform original empirical analyses that allow to infer a causal effect of market concentration on prices and other outcomes. For the remaining sectors, we carry out a qualitative comparison of prices and their main determinants across Member States. In general, we find that concentration seems to have an important role in explaining price differences, even considering the other potential sources of heterogeneity in outcomes.

We investigate the impact of concentration on both price and investment in the mobile telecom services sector. Our results point to a strong, positive relationship between prices and market concentration. Prices in the US are considerably higher to those prevailing in the EU, where the number of Mobile Network Operators (MNOs) – suppliers that own their network – is much higher relative to market size. More generally, markets with more MNOs tend to exhibit lower prices, after adjusting for other differences; in particular, we find that an increase in HHI by 1,000 causes an increase in prices by 11-18%. The role of operators without their own physical networks – so-called Mobile Virtual Network Operators (MVNOs) – seems to be negligible for explaining price differences, even though these operators do tend to offer lower prices than their rival MNOs: the reason may be that MVNOs do not compete with MNOs for the same customers. When looking at the relationship between investment and concentration, we do not find that higher concentration leads to higher levels of investment; further, differently than for prices, MVNOs seem to play a meaningful role in fostering investment in mobile telecommunications.

For airlines, the analyses performed suggest that, in line with the literature, market structure has a strong impact on prices, which we find to be substantially higher in markets that are more concentrated. This finding is confirmed both by a panel regression analysis on a comprehensive dataset of European as well as US routes, and by an event study that exploits the exit of the market of a prominent European airline, Air Berlin, to identify the causal impact of market concentration on prices. In the latter analysis we find that the increase in concentration in many routes caused by Air Berlin's exit was accompanied by an immediate jump in price levels of about 19.4%, that was only mitigated over the years as new competitors began to serve the relevant routes.

For beer, mortgages, modern consumer retail and cement, we identify a subset of EU countries and analyse price differences across them, as well as differences in the relevant price determinants, including concentration. We find that differences between the lowest and highest prices, among those observed in our samples, are around 66% for beer, 37% for mortgages, 38% for modern consumer retail and 80% for cement. Overall, we find that cost differences do not seem to fully justify the observed price differences between countries; that regulation may be a contributing factor; and that concentration may determine part of the observed differences. Specifically for each sector, we find that:

- for beer, prices observed in Germany are 66% lower compared to other countries in our sample, and the German beer market exhibits a much lower degree of concentration;
- for mortgages, more concentrated markets tend to have higher mortgage rates, with rates differing by as much as 0.71 percentage points, though different risk levels across countries may also account for some of these differences;
- for modern consumer retail (essentially, supermarkets) there is a tendency to find higher prices in countries with more concentration, although the extent to which our analyses are able to capture all the relevant sources of price differences is limited by the complexities of these markets;
- for cement, higher prices seem to be associated with higher regional concentration levels and, possibly, national regulatory standards.

Despite our efforts to select samples of countries that guarantee a good coverage in terms of geographical and size distribution, we acknowledge that the results of the four studies described above may still be sensitive to country selection. More generally, we emphasize

that, due to the lack of causal analysis (for beer, mortgages, modern consumer retail and cement), much care is needed to avoid over-interpreting the associated results. On balance, however, economic theory, prior empirical work and our own analyses support the idea that, all other things being equal, higher market concentration is associated with higher prices. To the extent that our findings are generalisable across other industries, they confirm that the trends of rising concentration described in chapter 1 of this study should be a reason for concern.

Chapter 3 of the report investigates the rise and persistence of the most profitable of the world's largest firms, which we refer to as "Global Superstars". While superstars have been the subject of economic studies for decades, the debate has been fueled by academic research pointing towards the role of companies at the top of the distribution in the observed increase in markups and concentration, as described in chapter 1.

We have defined "Global Superstars" as the 50 most profitable companies among world's largest companies by revenue for five 5-year periods between 1998 and 2022. We used the Fortune Global 500 dataset, thereby restricting our attention to the world's 500 largest firms in terms of revenue. Global Superstars were selected within this group as the firms with the highest combined absolute profit and profit rate.

Even among the global elite of firms included in the Fortune Global 500, the Global Superstars stand out:

- Global Superstars earn vast profits: their average yearly profit in the latest period was 14.5 billion USD. This compares to 3.5 billion USD for other Fortune Global 500 firms;
- the Global Superstars' profitability increased sharply: their profit rate has almost doubled over the last 25 years, growing from 11% in 1998 to 20% in 2022, while there was only a small increase for the average Fortune Global 500 firm, resulting in a widening gap between profits of Global Superstars and other Fortune Global 500 firms;
- profits are concentrated at the very top: even among the Global Superstars, there is a pronounced and widening gap between the "average Superstar" and the very most profitable firms. The firms at the very top of the Global Superstar list earn significantly more than other Global Superstars and have increased their profits much more in recent decades.

We have also explored the geographical origin of Global Superstars, showing that the US hosts around half of them. China hosts an increasing number of Global Superstars, while the share of Global Superstars incorporated in the EU and UK has declined over the last 25 years.

Exploring the sectors in which the Global Superstars are active, we found that they produce across a wide range of sectors. The distribution of Global Superstars across sectors has evolved considerably overtime: for instance, electronic firms (incl. hardware, software and internet services) make up an increasing share of Global Superstars, while mining, oil and energy production has become less prevalent amongst Global Superstars, and pharmaceutical firms represent a large proportion of Global Superstars.

Overall, we found little turnover amongst Global Superstars. The set of most profitable of the world's largest firms remained surprisingly stable in the last 25 years, especially in the consumer goods and the pharmaceutical sectors. A few Global Superstars exhibit strong persistence across the last 25 years: 11 firms were ranked among the 50 most profitable firms in all 5-years periods studied (Coca-Cola, Intel, Johnson and Johnson, Microsoft, Nestle, Novartis, Pfizer, Philip Morris, Procter and Gamble and Roche). Other 13 Global Superstars were present in four of the five 5-year periods studied. Interestingly, 7 of these 24 most persistent firms are pharmaceutical companies.

The persistence of Global Superstars accumulating vast amounts of profits raises the question of why these profits are not competed away. As a probable cause, we have explored whether barriers to entry protect Global Superstars from competition. This analysis was more qualitative, because our analysis was undertaken globally in very broad sectors – namely consumer goods, IT and pharmaceuticals – while barriers to entry can only be identified for specific geographic and product markets.

In the consumer goods sector, Global Superstars are likely to benefit from brand loyalty, product differentiation and economies of scale (and possibly economies of scope, due to their portfolio of brands). Most Global Superstars invest heavily in their brands (and other intangible assets), which in some cases have become must-have brands for retailers. Consequently, the combination of brand loyalty and economies of scale constitute barriers to entry that are likely to protect Global Superstars' turnover and profits from potential entrants.

In the IT sector, Global Superstars are likely to benefit from direct and indirect network effects, economies of scale and scope, and the presence of proprietary technologies. Strategic behaviour may also have protected Global Superstars from competition. Even if entrants have played a more active role in the IT sector in the past two decades than in the consumer goods and pharmaceutical sectors, it remains to be seen if entrants will be able to play the same important disruptive role looking forward.

In the pharmaceutical sector, Global Superstars are protected by patents; and, in some cases, by strategic behaviour of firms relying on features of the patent and regulatory framework. Some features of the patent and regulatory system have attracted some criticism for providing too much protection for incremental innovations. While it goes beyond the scope of this report to explore the advantages and disadvantages of the intellectual property rights systems, they contribute to create barriers to entry and favour incumbent firms over entrants.

Overall, our findings suggest that (i) several drivers likely contributed to the rise and persistence of Global Superstars, that (ii) some of these drivers may be simultaneously or sequentially at play and that the mix of causes depends very much on the sector, as also suggested by the economic literature. However, the entrenchment at the top of the profit distribution calls for careful vigilance by competition authorities.

The objective of chapter 4 is to analyse the impact of domestic competition (i.e. competition within markets in the EU) on the export performance of European firms outside the EU. Exports outside the EU represent about 15% relative to GDP for the countries we consider in the study. They are important for EU economies and hence governments should carefully understand and consider the drivers of firms' success in international markets. Chapter 4 investigates the relationship between domestic competition and export performance, identifying the channels linking them and providing new evidence to assess the role they play through a survey.

The relevant economic literature is unanimous in pointing out that effective competition in domestic input markets has a positive effect in export performance, lowering the price and improving the quality of both physical inputs and services. In turn, this allows EU-based firms that use such inputs to be more competitive in international markets. With respect to the role played by competition in the exporters' own market, i.e. the domestic market where they operate, the insights from the economic literature are somewhat more mixed. Most scholars argue that firms that face effective competition at home will strive to be more efficient, to make their offer more attractive for customers through innovation and product differentiation, and will thus be better equipped when competing against their international rivals. Some authors, however, suggest instead that a second mechanism prevails, going in the opposite direction, whereby more competition in the domestic market may be detrimental to exports, since it prevents firms from reaching the scale that would enable them to compete effectively in international markets. These contributions advocate for governments' intervention to incentivise the creation of "national export champions", even at the expense of effective merger control.

Chapter 4 informs the debate on the role of domestic competition in export performance through a survey administered to European exporting firms that are active in leading export sectors. A questionnaire was administered to 398 European companies that operate either in the top export sectors of each country included in the study (Austria, Belgium, Czech Republic, France, Germany, Italy, Poland, Romania, Spain, Sweden, and the Netherlands) or in the top export sectors for the EU-27 as a whole. The sample of exporters is mainly composed by small firms and mid-caps (74% are SMEs and at least 14% mid-caps). Most of them are established firms (only 2% of firms are less than 10 years old)

that export to several non-EU countries (57% of firms declare to export to more than 5 extra-EU countries).

The objective of the survey is to assess the role and relevance for export performance of the three factors outlined above, namely (i) competition in domestic upstream markets for physical inputs, (ii) competition in domestic upstream markets for input services, and (iii) competition in the domestic market for their own products. All three factors are regarded as being highly important for export success by our respondents: competition in domestic upstream markets for physical inputs appears to be the most important factor (important for 80% of respondents), followed by competition in domestic upstream markets for input services and competition in the domestic market for their own products (67% for both). We discuss each factor in more detail below.

84% of respondents procure their main physical input in the EU, which contributes to explaining why competition in domestic upstream markets matters a great deal for our respondents. Among the firms that procure their main physical input in the EU, the feature of the main input that respondents most care about is product quality, followed by price: this holds across all the sectors where respondents are active. Competition among suppliers of the main input is generally perceived to be effective, especially on price.

Coming to the upstream markets for services, we found that transport and logistics is by far perceived as the most important one for respondents (94% regard it as important), followed by energy (83%), IT and communication services (77%), and R&D (71%). For most of the services, the price of the input is perceived to be a very important factor impacting export competitiveness: this is particularly true for services with relatively high standardization like energy (82%), transport and logistics (75%) and financial services (70%); on the other hand, quality of the service input is regarded as very important for R&D (80%), creative inputs (74%), and transport and logistics (73%). More than 50% of the respondents consider competition for each service to be effective; among all the services, transport and logistics appears to be the one where competition is perceived to be most effective.

Our respondents report to be subject to relatively effective competition in the domestic market for their own products. 45% state to have 4 to 10 credible competitors for their products in domestic markets; 30% state to have over 10 competitors; and only 25% state to have only 3 competitors or less. Respondents perceive to face a medium to high level of competition in the aspects that they consider the most relevant for their success in the domestic market, which are quality (the main driver for 55% of respondents) and to a lesser extent price (27%), with price competition being perceived as the most intense Results are somewhat heterogenous across the sectors where respondents are active, with less competitors (about 40% responding that they have 3 or less credible competitors) being reported for Chemicals, Machinery, and Wood sector, where barriers to entry (access to capital and natural resources) are likely to be more relevant.

Directly relevant to the "national export champions" theory, firms in our sample have been asked if effective competition in the domestic market for their own products improves or not their export competitiveness and how. Most respondents reported that domestic competition has a positive impact on export performance: 85% of respondents said that domestic competition incentivises firms to improve or maintain product quality, 84% said it incentivises firms to increase efficiency, and 78% reported that it increased innovation at the company. Much fewer respondents highlighted a negative impact, and in fact 66% of respondents said that domestic competition does not curb their size in a way damaging their export competitiveness. Interestingly, the proportion of respondents that thinks that domestic competition improves export performance increases with the perceived number of competitors in the domestic market.

Overall, the outcome of the survey confirms the general principle postulated by authors such as M. Porter and H. Simon that effective competition 'at home' strengthens the export competitiveness of the firms involved. The channels identified in the literature are also largely confirmed by the survey results, since a large share of respondents believes that competition incentivises them to improve quality, enhance efficiency, and innovate.

Chapter 5 provides original evidence of the macro-economic benefits of effective competition for the economy, and of why the weakening of competition across EU markets should be a source of concern. Whilst several aspects of these developments are debated, including the specific sectors concerned and their drivers, there is consensus that reductions in the degree of competition may result in adverse macroeconomic consequences, such as reduced investments, declining productivity, and a shrinking labour share of income. Chapter 5 seeks to provide an estimate of such adverse consequences based on a methodology which combines micro- and macro-level approaches, relying on own estimates of markups and a general equilibrium macroeconomic model.

The first step of the micro-level analysis is to estimate firm-level markups for 117,000 firms from 23 EU Member States based on data from Orbis. As described in chapter 1, markups are widely used in the economic literature to measure the degree of competition: markups represent the ratio of price to marginal costs, and can be interpreted as a measure of market power. Indeed, *ceteris paribus*, the lower is the degree of competition that firm face, the higher will be the markup (whereas one of the features of perfect competition is that prices will equal marginal costs, meaning that the markup will be equal to 1). We find that the average markup of European firms increased by 6.4% between 2012 and 2019, with an average level of 1.42 in 2019. Our markup estimates appear robust to changes in the methodology chosen, and are consistent with the estimates available in the literature.

The subsequent step is to employ a general equilibrium macroeconomic model to compare macroeconomic outcomes – GDP, prices, employment, firms' profits and households consumption – across two scenarios: (i) a benchmark or baseline scenario, which reflects the current or a past state of competition and (ii) a counterfactual scenario constructed based on the hypothesis that nothing else, other than the degree of competition, changes with respect to the baseline scenario. The difference between the two scenarios is triggered by a change – or *shock* – in the average value of markups, which can be interpreted as a change in the degree of competition across markets in the EU.

Different baseline and counterfactual scenarios have been considered, as described below:

- exploiting the results of the empirical literature that has documented a rise in markups since 2000, the *Historical* scenario assumes a markup shock in the past. The underlying idea is to simulate a counterfactual evolution of the EU economy in absence of the observed increase in markup, with all other factors remaining constant. Results of this exercise should be interpreted as an indication of the cost of the weakening of competition that took place in the past two decades. Our results indicate that, had Europe not experienced an 7.54% increase in markup over the period 2000-2015, it could have had a GDP more than 4% higher in 2015 and more than 5% higher in 2020;
- building on our own estimates of markups, the *Trimming* scenario assumes that all markups above the 97th percentile of the observed markup distribution are capped at the value of the 97th percentile of the markup distribution, which translates into an average markup lower by 8.45%. The logic is to simulate the effect of policies aimed at curbing the market power of those firms that enjoy the most market power. We estimate that a similar reduction in the levels of markups today would translate to an increase in the EU GDP by approximately 2.5% and 4.2% after five and ten years, respectively;
- again building on our own estimates of markups, the *Convergence* assumes that the country-level markups of countries with markups higher than the EU average are reduced, and converge towards the EU average. The logic is to simulate the introduction of pro-competitive reforms that flatten the differences in the degree of competition among Member States. This would lead to an aggregate reduction of markups by 8.38%. Our model predicts that this would translate into an increase of real GDP by 2.4% and 4.1%, respectively, after five and ten years.

Finally, chapter 5 empirically explores the link between markups and Total Factor Productivity (TFP), which is of fundamental importance for the long-term prosperity of an economy, finding that a higher degree of competition fosters TFP. We find that, in all three counterfactual scenarios, the estimated benefits would be further magnified considering

not only the direct effect of changes in markups, but also the potential indirect effects on TFP.

Some caution is warranted in the interpretation of these results. Competition is a complex and multi-faceted process and can take different shapes depending on the market at hand. Measuring it accurately is a challenging task, and every proxy that can be used for this purpose has some sources of imperfection. Markups are no exception: their rise can underlie an increase in market power, and thus weaker competition, but also, *inter alia*, efficiency gains. Further, the stylized nature of the assumptions and simulations inherent in the macro-economic modelling call for caution in directly translating theoretical results into real-world impacts. Despite these limitations, however, our results confirm that more effective competition – as proxied by lower markups – is shown to benefit the economy through various channels, and in particular to curb inflation, fostering increased households' consumption, and driving further investments from enterprises. They also show that, while non-negligible gains could be obtained in a relatively short time, it would take a long-term commitment to undo the loss caused by the recent rise in markups.

Overall, this report shows that, on average, competition may have weakened across markets in the EU; while providing comprehensive original evidence of the multifaceted benefits of effective competition, which has been shown to deliver improved outcomes for customers, to boost the competitiveness of domestic companies in international markets and, more generally, to contribute to economic growth and societal well-being. Such benefits are shown to be sizeable, urging policy-makers to consider them carefully when deciding which policy objectives should be prioritized.

Résumé exécutif

Un consortium composé de Lear (chef de file), E.CA Economics, Prometeia, University of East Anglia et Verian (ci-après, collectivement, l'"Equipe") a été chargé par la Direction Générale de la Concurrence de la Commission Européenne de mener une étude pour fournir des éléments factuels sur certains aspects de l'état de la concurrence dans l'Union Européenne ainsi qu'estimer le coût des problèmes de concurrence pour l'économie dans son ensemble.

La concurrence est un processus dynamique de rivalité dans lequel les entreprises se disputent la demande sur le marché. Lorsqu'il est efficace, ce processus permet généralement d'aboutir à de meilleurs résultats pour les consommateurs. Un degré d'intensité concurrentielle élevé sur le marché pousse les entreprises à se livrer une concurrence plus forte pour attirer les consommateurs : cela peut se traduire de différentes manières selon le marché, notamment une baisse des prix, une amélioration de la qualité des produits, une augmentation de la variété pour répondre aux besoins des consommateurs, et une introduction d'innovations incrémentales et/ou disruptives. Il a été démontré qu'une concurrence efficace contribue à la productivité, à l'investissement, à l'innovation et, en fin de compte, à la croissance.

Notre étude s'inscrit dans le contexte d'une littérature économique émergente qui, ces dernières années, a montré que de nombreuses économies avancées ont connu une détérioration de certains indicateurs de concurrence et de diverses mesures des performances économiques liées à l'état de la concurrence. La littérature suggère notamment que : la concentration sectorielle semble avoir augmenté ; les marges ont augmenté, en particulier pour les entreprises à la queue de la distribution de la profitabilité; le dynamisme entrepreneurial a diminué ; et les structures du marché sont devenues plus asymétriques, en termes de taille ainsi qu'en termes de marges. Le chapitre 1 de ce rapport passe en revue cette littérature et conclut que, bien qu'aucun des indicateurs ci-dessus n'est parfait, ils suggèrent ensemble que la concurrence s'est probablement affaiblie dans l'UE.

Dans ce contexte, notre étude examine quatre aspects importants de l'état de la concurrence dans l'Union Européenne. Le chapitre 2 présente six études sectorielles transnationales sur la concentration des prix qui fournissent des preuves qualitatives et, pour les télécommunications mobiles et les compagnies aériennes, des preuves empiriques qu'une plus grande concentration semble être associée à des prix plus élevés. Le chapitre 3 étudie l'évolution des "Global Superstars" (c'est-à-dire les entreprises les plus grandes et les plus profitables du monde), en décrivant leur profitabilité et les barrières à l'entrée qui protègent leur position de leader sur le marché. Le chapitre 4 analyse le rôle que joue la concurrence domestique dans la détermination de la compétitivité des entreprises européennes sur les marchés d'exportation, entre autres au moyen d'une enquête auprès des entreprises exportatrices de l'UE. Le chapitre 5 estime les marges de 117 000 entreprises de 23 États membres afin de simuler comment la croissance du produit intérieur brut (PIB), l'emploi, l'investissement, les exportations et d'autres indicateurs macroéconomiques seraient influencés par une concurrence plus effective sur les marchés de l'UE. Les principales conclusions de chaque chapitre sont détaillées ci-dessous.

La concentration du marché ou de l'industrie est l'un des indicateurs les plus utilisés pour analyser le niveau de concurrence, qui à son tour affecte les résultats du marché, et notamment les prix : le chapitre 2 vise donc à évaluer le rôle de la concentration afin d'expliquer les différences de prix observées entre les États membres dans des secteurs spécifiques de l'économie.

Nous constatons qu'après plus de 50 ans d'efforts gouvernementaux pour créer un marché unique européen, un nombre étonnamment élevé de produits présente une variation de prix entre les pays de l'UE. Ces différences de prix n'indiquent pas que la politique du marché unique n'a pas fonctionné, mais plutôt que de nombreux facteurs susceptibles d'influer sur les prix varient d'un État membre à l'autre. Ces facteurs comprennent les différences de coûts, les taxes, le niveau de réglementation et, ce qui est le plus important pour la présente étude, le degré de concurrence (qui, dans ce chapitre, est représenté par différents indicateurs de concentration du marché).

L'influence de la concentration du marché sur les prix est généralement confirmée par la littérature théorique et empirique. Plusieurs études suggèrent que les augmentations de concentration sont associées à des prix plus élevés, toutes choses étant égales par ailleurs. Toutefois, la littérature souligne que de simples corrélations entre le prix et la concentration ne suffisent pas à établir une relation de causalité convaincante entre les deux, et que des analyses empiriques plus sophistiquées sont nécessaires.

Afin d'explorer le rôle des différentes sources de variation des résultats (qu'il s'agisse des prix ou de la qualité) entre les États membres - et, notamment, d'étudier le rôle de la concentration - nous étudions six secteurs d'activité pour un examen plus approfondi : le transport aérien, les télécommunications mobiles, la bière, les prêts hypothécaires, le commerce de détail et le secteur cimentier. Ces secteurs, qui comprennent des activités « business to consumer » (B to C) et « business to business » (B to B), ont été sélectionnés parce qu'ils ont un impact majeur sur l'économie et ils sont caractérisés par des différences de prix importantes entre les États membres.

Pour le secteur des services de télécommunications mobiles et celui du transport aérien, nous faisons des analyses empiriques qui permettent de déduire un effet causal de la concentration du marché sur les prix et d'autres variables d'intérêt. Pour les autres secteurs, nous faisons une comparaison qualitative des prix et de leurs principaux déterminants entre les États membres. En général, nous constatons que la concentration semble jouer un rôle important dans l'explication des différences de prix, même en tenant compte des autres sources potentielles d'hétérogénéité.

Nous étudions l'impact de la concentration sur les prix et les investissements dans le secteur des services de télécommunications mobiles. Nos résultats indiquent une relation forte et positive entre les prix et la concentration sur le marché. Les prix aux États-Unis sont considérablement plus élevés que ceux pratiqués dans l'UE, où le nombre d'opérateurs de réseaux mobiles (MNO) - fournisseurs qui possèdent et gèrent leur propre infrastructure - est beaucoup plus élevé par rapport à la taille du marché. En général, les marchés avec plusieurs MNO sont caractérises par des prix plus bas, même en tenant compte des autres différences ; notamment, nous constatons qu'une augmentation de l'IHH de 1000 entraîne une augmentation des prix de 11-18%. Le rôle des opérateurs qui ne disposent pas de leur propre réseau physique - appelés opérateurs de réseaux mobiles virtuels (MVNO) - semble être négligeable pour expliquer les différences de prix, même si ces opérateurs ont tendance à proposer des prix inférieurs à ceux de leurs concurrents MNO ; peut-être que la raison de cela est que les MVNO ne sont pas en concurrence avec les MNO pour les mêmes clients. Quant à la relation entre l'investissement et la concentration, nous ne constatons pas qu'une plus grande concentration entraîne des niveaux d'investissement plus élevés ; en outre, contrairement aux prix, les MVNO semblent jouer un rôle significatif en favorisant l'investissement dans les services de télécommunications mobiles.

Pour le secteur du transport aérien, nos analyses suggèrent que, conformément à la littérature, la structure du marché a un impact important sur les prix, qui sont nettement plus élevés sur les marchés les plus concentrés. Ce résultat est confirmé par une analyse de régression avec des données de panel relatives aux destinations aériennes européennes et américaines, et par une étude d'événements qui utilise la sortie du marché d'une grande compagnie aérienne européenne, Air Berlin, pour identifier l'impact causal de la concentration du marché sur les prix. Dans cette dernière analyse, nous constatons notamment que l'augmentation de la concentration sur de nombreuses destinations causée par la sortie du marché d'Air Berlin est accompagnée d'une hausse immédiate des niveaux de prix d'environ 19.4%, atténuée seulement au cours des années suivantes, lorsque de nouveaux concurrents ont commencé à opérer sur les destinations en question.

Quant aux secteurs de la bière, des prêts hypothécaires, du commerce de détail et du ciment, nous analysons dans un sous-ensemble de pays de l'UE les différences de prix entre eux, ainsi que les différences dans les déterminants de prix, y compris la concentration. Nous constatons que les différences de prix entre les pays de l'UE le moins cher et le plus cher de notre base de données sont d'environ 66% pour le secteur de la bière, 37% pour ce des prêts hypothécaires, 38% pour le commerce de détail et 80% pour le ciment. Dans l'ensemble, nous constatons que les différences de coûts ne semblent pas

justifier les différences de prix observées entre les pays ; que la réglementation peut jouer un rôle et que la concentration peut également être un facteur important. Pour chaque secteur, nous constatons que :

- Pour la bière, les prix observés en Allemagne sont inférieurs de 66% à ceux des autres pays, et le marché allemand a un degré de concentration plus faible ;
- Pour les prêts hypothécaires, les marchés les plus concentrés ont tendance à avoir des taux hypothécaires plus élevés, avec des différences de taux allant jusqu'à 0.71 points de pourcentage, bien que des niveaux de risque différents puissent également expliquer certaines de ces différences ;
- Pour le commerce de détail (essentiellement les supermarchés), les prix ont tendance à être plus élevés dans les pays où la concentration est plus forte. Toutefois, nous reconnaissons que la capacité de nos analyses à saisir toutes les sources pertinentes de différences de prix est limitée par la complexité de ces marchés ;
- Pour le ciment, les prix plus élevés semblent être associés à des niveaux de concentration régionale plus élevés et, éventuellement, à des normes réglementaires nationales.

Malgré nos efforts pour sélectionner des échantillons de pays garantissant une bonne couverture en termes de répartition géographique et de taille, nous reconnaissons que les résultats des quatre études décrites ci-dessus peuvent être liés à la sélection des pays. Plus généralement, nous soulignons qu'en raison de l'absence d'analyse causale (pour les secteurs de la bière, des prêts hypothécaires, du commerce de détail et du ciment) il convient d'être très prudent afin d'éviter de surinterpréter ces résultats. Dans l'ensemble, cependant, la théorie économique, les études empiriques existantes et nos propres analyses soutiennent l'idée que la concentration du marché est liée aux prix, toutes autres choses étant égales par ailleurs. Dans la mesure où nos résultats sont généralisables à d'autres secteurs, ils confirment que les tendances à la hausse de la concentration décrites au chapitre 1 de la présente étude devraient être une source de préoccupation.

Le chapitre 3 de ce rapport étudie l'essor et la persistance des entreprises les plus grandes et les plus profitables du monde, que nous appelons les "Global Superstars". Si les superstars font l'objet d'études économiques depuis des décennies, le débat a été alimenté par des recherches universitaires qui ont mis en évidence le rôle des entreprises à la queue de la distribution dans l'augmentation des marges et de la concentration, comme décrit au chapitre 1.

Nous avons défini les "Global Superstars" comme les 50 entreprises les plus profitables parmi les plus grandes entreprises du monde en termes de chiffre d'affaires pour cinq périodes quinquennales entre 1998 et 2022. Nous avons utilisé les données de Fortune Global 500, et nous avons ainsi concentré notre attention sur les 500 plus grandes entreprises du monde en termes de chiffre d'affaires. Les "Global Superstars" ont été sélectionnées au sein de ce groupe, en tant qu'entreprises affichant le profit absolu et le taux de profit les plus élevés.

Même parmi l'élite mondiale des entreprises figurant dans le classement Fortune Global 500, les "Global Superstars" se distinguent :

- Les "Global Superstars" réalisent des profits considérables : leur profit annuel moyen au cours de la dernière période était de 14,5 milliards de dollars. Ce chiffre est à comparer aux 3,5 milliards de dollars des autres entreprises du classement Fortune Global 500 ;
- La rentabilité des "Global Superstars" a fortement augmenté : leur taux de profit a presque doublé au cours des 25 dernières années, passant de 11% en 1998 à 20% en 2022, alors que la moyenne des entreprises du classement Fortune Global 500 n'a connu qu'une faible augmentation, ce qui a creusé l'écart entre les profits des "Global Superstars‟ et ceux des autres entreprises du classement Fortune Global 500 ;
- Les bénéfices sont concentrés au sommet : même parmi les "Global Superstars", il existe un écart prononcé et croissant entre la "superstar moyenne" et les entreprises les plus profitables. Les entreprises situées tout en haut de la liste des "Global Superstars" gagnent beaucoup plus que les autres "Global Superstars" et ont

augmenté leurs profits de manière beaucoup plus importante au cours des dernières décennies.

Nous avons également étudié l'origine géographique des "Global Superstars", montrant que les États-Unis accueillent environ la moitié d'entre elles. La Chine aussi accueille un nombre croissant de "Global Superstars". La part des "Global Superstars" enregistrées dans l'UE et au Royaume-Uni a diminué au cours des 25 dernières années.

Quant aux secteurs dans lesquels les "Global Superstars" sont actives, nous avons constaté qu'elles produisent dans un large éventail de secteurs. La répartition des "Global Superstars" entre les secteurs a considérablement évolué au cours des années : par exemple, les entreprises du secteur de l'électronique (comprenant le hardware, les logiciels et les services Internet) représentent une part croissante des "Global Superstars", tandis que la production minière, pétrolière et énergétique est devenue moins fréquente parmi les "Global Superstars", et que les entreprises pharmaceutiques conservent une part élevée parmi les "Global Superstars".

Dans l'ensemble, nous n'avons constaté qu'une faible évolution parmi les "Global Superstars". Les plus profitables des plus grandes entreprises mondiales sont restées étonnamment stables au cours des 25 dernières années, en particulier dans les secteurs des biens de consommation et de l'industrie pharmaceutique.

Quelques "Global Superstars" présentent une forte persistance au cours des 25 dernières années : 11 entreprises ont été classées parmi les 50 entreprises les plus profitables au cours des cinq années étudiées (Coca-Cola, Intel, Johnson and Johnson, Microsoft, Nestlé, Novartis, Pfizer, Philip Morris, Procter and Gamble et Roche). 13 autres "Global Superstars" étaient présentes dans quatre des cinq périodes quinquennales étudiées. Il est intéressant de noter que 7 de ces 24 entreprises les plus persistantes sont des sociétés pharmaceutiques. La persistance des "Global Superstars" à accumuler d'énormes profits soulève la question de savoir pourquoi ces profits ne suscitent pas plus de concurrence.

Comme cause probable, nous avons cherché à savoir si les barrières à l'entrée protégeaient les "Global Superstars" de la concurrence. Cette analyse était plus qualitative, car notre analyse a été entreprise au niveau mondial dans des secteurs très vastes – notamment ceux des biens de consommation, des technologies de l'information et des produits pharmaceutiques – alors que les barrières à l'entrée ne peuvent être identifiées que pour des marchés géographiques et des marchés de produit spécifiques.

Dans le secteur des biens de consommation, les "Global Superstars" sont susceptibles de bénéficier de la fidélité à la marque, de la différenciation des produits et des économies d'échelle (et éventuellement des économies de gamme, en raison du portefeuille de marques).

La plupart des "Global Superstars" investissent massivement dans leurs marques (et autres actifs incorporels) qui, dans certains cas, sont devenues des marques incontournables pour les enseignes de supermarchés. Par conséquent, la combinaison de la fidélité à la marque et des économies d'échelle constitue une barrière à l'entrée susceptible de protéger le chiffre d'affaires et les bénéfices des "Global Superstars" contre des entrants potentiels.

Dans le secteur des technologies de l'information, les "Global Superstars" peuvent bénéficier d'effets de réseau directs et indirects, d'économies d'échelle et de gamme, et de la présence de technologies brevetées. Des comportements stratégiques peuvent également avoir protégé les "Global Superstars" de la concurrence. Même si les nouveaux entrants ont joué un rôle plus actif dans le secteur des technologies de l'information au cours des deux dernières décennies que dans les secteurs des biens de consommation et des produits pharmaceutiques, il reste à voir si les nouveaux entrants seront en mesure de jouer le même rôle disruptif à l'avenir.

Dans le secteur pharmaceutique, les "Global Superstars" sont protégées par des brevets et, dans certains cas, par le comportement stratégique des entreprises qui s'appuient sur les caractéristiques du cadre réglementaire et des brevets. Certaines caractéristiques du système de brevets et de réglementation ont été critiquées parce qu'elles offrent une protection trop importante aux innovations incrémentales. Bien que l'étude des avantages

et des inconvénients des systèmes de droits de propriété intellectuelle dépasse le cadre du présent rapport, ces systèmes contribuent à créer des barrières à l'entrée et favorisent les entreprises en place aux dépens des entrants.

Dans l'ensemble, nos résultats suggèrent que (i) plusieurs facteurs ont probablement contribué à l'essor et à la persistance des "Global Superstars", et (ii) certains de ces facteurs peuvent avoir un effet simultané ou séquentiel, et la combinaison des causes dépend fortement du secteur, comme le suggère aussi la littérature économique. Toutefois, la stabilité au sommet de la distribution des bénéfices montre la nécessité d'une attention particulière de la part des autorités de la concurrence.

L'objectif du chapitre 4 est d'analyser l'impact de la concurrence sur le marché domestique (c'est-à-dire la concurrence au sein des marchés de l'UE) sur les performances sur les marchés à l'exportation des entreprises européennes en dehors de l'UE. Les exportations en dehors de l'UE représentent environ 15% du PIB pour les pays considérés dans cette étude. Les exportations en dehors de l'UE sont importantes pour les économies de l'UE et les gouvernements devraient donc examiner attentivement les facteurs de réussite des entreprises sur les marchés internationaux. Le chapitre 4 étudie plus en détail la relation entre la concurrence domestique et les performances à l'exportation, identifie ce qui les relie et fournit de nouveaux éléments de preuve pour évaluer le rôle de chaque aspect par le biais d'un sondage.

La littérature économique pertinente est unanime pour souligner qu'une concurrence efficace sur les marchés des intrants domestiques a un effet positif sur le succès des exportations, en abaissant le prix et en améliorant la qualité des intrants physiques et des services. A son tour, cela permet aux entreprises européennes qui utilisent ces intrants d'être plus compétitives sur les marchés internationaux. Quant au rôle joué par la concurrence sur marché domestique des exportateurs, les conclusions de la littérature économique sont un peu plus mitigées. La plupart des chercheurs affirment que les entreprises confrontées à une concurrence effective sur leur marché domestique s'efforceront d'être plus efficaces et, afin de rendre leur offre plus attrayante pour les consommateurs, elles investissent dans l'innovation et la différenciation des produits. Par conséquent, elles seront mieux armées pour affronter leurs concurrents internationaux. Certains auteurs suggèrent néanmoins qu'un second mécanisme prévaut, opposé au premier, selon lequel une concurrence accrue sur le marché domestique peut avoir des répercussions négatives sur les exportations, car elle empêche les entreprises d'atteindre l'échelle qui leur permettrait d'être compétitives sur les marchés internationaux. Ces contributions soutiennent l'intervention des gouvernements pour encourager la création de "champions nationaux de l'exportation", même au détriment d'un contrôle efficace des concentrations.

Le chapitre 4 alimente le débat sur le rôle de la concurrence domestique pour les performances à l'exportation par le biais d'une enquête menée auprès d'entreprises exportatrices européennes actives dans les principaux secteurs d'exportation. Un questionnaire a été envoyé à 398 entreprises européennes qui opèrent soit dans les principaux secteurs d'exportation de chaque pays inclus dans l'étude (Autriche, Belgique, République Tchèque, France, Allemagne, Italie, Pologne, Roumanie, Espagne, Suède et Pays-Bas), soit dans les principaux secteurs d'exportation de l'UE-27 dans son ensemble. L'échantillon d'exportateurs est principalement composé de petites entreprises et de sociétés de taille moyenne (74% sont des PME et au moins 14% des sociétés de taille moyenne). La plupart d'entre elles sont des entreprises bien établies (seules 2% des entreprises ont moins de 10 ans) qui exportent vers plus de 5 pays extracommunautaires.

L'objectif de l'enquête est d'évaluer le rôle et l'importance pour les performances à l'exportation des trois facteurs décrits ci-dessus, notamment (i) la concurrence sur les marchés domestiques amont pour les intrants physiques, (ii) la concurrence sur les marchés domestiques amont pour les services liés aux intrants, et (iii) la concurrence sur le marché domestique pour leurs propres produits.

Nos répondants considèrent que ces trois facteurs sont très importants pour le succès des exportations : la concurrence sur les marchés domestiques amont pour les intrants physiques semble être le facteur le plus important (important pour 80 % des répondants),

suivi par la concurrence sur les marchés domestiques amont pour les services liés aux intrants et la concurrence sur le marché domestique pour leurs propres produits (67 % pour les deux). Nous examinons chaque facteur plus en détail ci-dessous. 84% des répondants achètent leurs principaux intrants physiques dans l'UE, et cela contribue à expliquer la raison pour laquelle la concurrence sur les marchés domestiques amont est très important selon nos répondants. Parmi les entreprises qui achètent leur principal intrant physique dans l'UE, les répondants considèrent que la caractéristique plus importante de ces intrants est la qualité du produit, suivie du prix : cela vaut pour tous les secteurs dans lesquels les répondants sont actifs. La concurrence entre les fournisseurs des principaux intrants est généralement perçue comme efficace, en particulier en ce qui concerne les prix.

En ce qui concerne les marchés amont de services, nous avons constaté que le transport et la logistique sont perçus comme les plus importants par les répondants (94 % les considèrent importants), suivis par l'énergie (83 %), les services informatiques et de communication (77 %) et la R&D (71 %). Pour la plupart des services, le prix de l'intrant est perçu comme un facteur très important pour la compétitivité à l'exportation : c'est particulièrement vrai pour les services relativement standardisés comme l'énergie (82 %), le transport et la logistique (75 %) et les services financiers (70 %) ; d'autre part, la qualité de l'intrant du service est considérée très importante pour la R&D (80 %), les intrants créatifs (74 %), et le transport et la logistique (73 %). Plus de 50 % des répondants considèrent que la concurrence pour chaque service est efficace ; parmi tous les services, le transport et la logistique semblent être ceux où la concurrence est perçue comme la plus efficace.

Nos répondants déclarent être soumis à une concurrence relativement efficace sur le marché domestique pour leurs produits. 45 % déclarent avoir entre 4 et 10 concurrents crédibles pour leurs produits sur les marchés nationaux ; 30 % déclarent avoir plus de 10 concurrents ; et seulement 25 % déclarent n'avoir que 3 concurrents ou moins. Les répondants perçoivent que le niveau de concurrence est moyen/élevé sur les aspects qu'ils considèrent comme les plus importants pour leur succès sur le marché domestique, notamment la qualité (le facteur principal pour 55 % des répondants) et, dans une moindre mesure, le prix (27%). Aussi, ils reportent que la concurrence sur les prix est perçue comme la plus intense.

Les résultats diffèrent en fonction des secteurs dans lesquels les répondants sont actifs. En particulier, ils montrent que les secteurs avec moins de concurrents (environ 40 % ont répondu qu'ils avaient 3 concurrents crédibles ou moins) sont les secteurs des produits chimiques, des machines et du bois, où les barrières à l'entrée (accès au capital et aux ressources naturelles) sont susceptibles d'être plus importantes.

En rapport direct avec la théorie des "champions nationaux de l'exportation", nous avons demandé aux entreprises de notre échantillon si une concurrence efficace sur le marché domestique pour leurs produits améliorait leur compétitivité à l'exportation et comment. La plupart des répondants ont indiqué que la concurrence domestique avait un impact positif sur les performances à l'exportation : 85 % des répondants ont déclaré que la concurrence domestique incitait les entreprises à améliorer ou à maintenir la qualité des produits, 84 % qu'elle incitait les entreprises à accroître leur efficacité et 78 % qu'elle augmentait l'innovation au sein de l'entreprise.

Beaucoup moins de répondants ont évoqué un impact négatif et, en fait, 66 % des répondants déclarent que la concurrence domestique ne réduit pas leur taille d'une manière qui nuise à leur compétitivité à l'exportation. Il est intéressant de noter que la proportion de répondants qui pensent que la concurrence domestique améliore les performances à l'exportation augmente avec le nombre perçu de concurrents sur le marché domestique.

Dans l'ensemble, les résultats de l'enquête confirment la théorie générale postulée par des auteurs tels que M. Porter et H. Simon, selon laquelle une concurrence domestique efficace renforce la compétitivité à l'exportation des entreprises concernées. Les canaux identifiés dans la littérature sont également largement confirmés par les résultats de l'enquête,

puisqu'une grande partie des répondants estiment que la concurrence les incite à améliorer la qualité, à renforcer l'efficacité et à innover.

Le chapitre 5 fournit des éléments de preuve originaux des avantages macroéconomiques de la concurrence pour l'économie, et des raisons pour lesquelles l'affaiblissement de la concurrence dans l'UE devrait être une source de préoccupation. Si plusieurs aspects de cette évolution font l'objet de débats, notamment pour ce qui concerne les secteurs concernés et les moteurs de cette évolution, il y a unanimité sur le fait qu'une réduction du degré de concurrence peut avoir des conséquences macroéconomiques négatives, telles que la réduction des investissements, la baisse de la productivité et la diminution de la part des revenus du travail. Le chapitre 5 fournit une estimation de ces conséquences négatives sur la base d'une méthodologie qui combine les approches micro et macroéconomiques, et utilise des estimations propres des marges et un modèle macroéconomique d'équilibre général.

La première étape de l'analyse au niveau microéconomique consiste à estimer les marges au niveau de l'entreprise pour 117 000 entreprises de 23 États membres de l'UE sur la base des données d'Orbis. Comme indiqué au chapitre 1, les marges sont largement utilisées dans la littérature économique pour mesurer le degré de concurrence : les marges représentent le rapport entre le prix et les coûts marginaux et peuvent être interprétées comme une mesure du pouvoir de marché. En effet, toutes autres choses étant égales par ailleurs, plus le degré de concurrence est faible, plus le taux de marge sera élevé (alors que l'une des caractéristiques de la concurrence parfaite est que les prix sont égaux aux coûts marginaux, et cela signifie que le taux de marge sera égal à 1). Nous constatons que le taux de marge moyen des entreprises européennes a augmenté de 6,4 % entre 2012 et 2019, avec une moyenne de 1,42 en 2019. Nos estimations de marges semblent robustes aux changements dans la méthodologie choisie et sont cohérentes avec les estimations disponibles dans la littérature.

L'étape suivante consiste à utiliser un modèle macroéconomique d'équilibre général pour comparer les résultats macroéconomiques - PIB, prix, emploi, bénéfices des entreprises et consommation des ménages - selon deux scénarios : (i) un scénario de référence ou de base, qui reflète l'état actuel ou passé de la concurrence et (ii) un scénario contrefactuel construit sur la base de l'hypothèse que rien d'autre, hormis le degré de concurrence, ne change par rapport au scénario de base.

La différence entre les deux scénarios est due à un changement - ou un choc - du niveau moyen des marges, qui peut être interprété comme un changement dans le degré de concurrence sur les marchés de l'UE. Différents scénarios de base et contrefactuels ont été envisagés, comme décrit ci-dessous :

- Utilisant les résultats de la littérature empirique qui a documenté une augmentation des taux de marge depuis 2000, le scénario historique suppose un choc de taux de marge dans le passé. L'idée est de simuler une évolution contrefactuelle de l'économie de l'UE en l'absence de l'augmentation observée du taux de marge, en maintenant les autres facteurs. Les résultats de cet exercice peuvent être interprétés comme une indication du coût de l'affaiblissement de la concurrence qui a eu lieu au cours des deux dernières décennies. Nos résultats indiquent que si l'Europe n'avait pas connu une augmentation de 7,54 % du taux de marge sur la période 2000-2015, elle aurait pu avoir un PIB supérieur de plus de 4 % en 2015 et de plus de 5 % en 2020 ;
- Sur base de nos propres estimations des taux de marge, le scénario de réduction suppose que tous les taux de marge supérieurs au 97e centile de la distribution des taux de marge observée sont plafonnés à la valeur du 97e centile de la distribution des taux de marge, ce qui se traduit par un taux de marge moyen inférieur de 8,45 %. La logique est de simuler l'effet de politiques visant à réduire le pouvoir de marché des entreprises qui en jouissent le plus. Nous estimons qu'une réduction similaire des niveaux de marge aujourd'hui se traduirait par une augmentation du PIB de l'UE d'environ 2,5 % et 4,2 % après cinq et dix ans, respectivement ;
- Sur base de nos propres estimations des marges, le scénario de convergence suppose que les marges nationales des pays dont les marges sont supérieures à la moyenne de l'UE sont réduites et convergent vers la moyenne de l'UE. L'idée est de simuler

l'introduction de réformes favorables à la concurrence qui aplanissent les différences de degré de concurrence entre les États membres. Cela conduirait à une réduction globale des marges de 8,38 %. Notre modèle prédit que cela se traduirait par une augmentation du PIB réel de 2,4 % et 4,1 %, respectivement, après cinq et dix ans.

Enfin, notre rapport explore le lien entre les marges et la productivité totale des facteurs (PTF), qui est d'une importance fondamentale pour la prospérité à long terme d'une économie, en constatant qu'un degré plus élevé de concurrence favorise la PTF. Nous constatons que, dans les trois scénarios contrefactuels, les avantages estimés seraient encore plus importants si l'on ne tenait pas seulement compte de l'effet direct des changements des marges, mais aussi des effets indirects potentiels sur la PTF.

Une certaine prudence s'impose dans l'interprétation de ces résultats. La concurrence est un processus complexe et multiforme qui peut prendre différentes formes en fonction du marché concerné. Mesurer précisément la concurrence est une tâche ardue, et chaque indicateur qui peut être utilisé à cette fin présente des imperfections. Les marges ne font pas exception : leur augmentation peut indiquer un renforcement du pouvoir de marché, et donc un affaiblissement de la concurrence, mais aussi, entre autres, des gains d'efficacité. Par ailleurs, la nature des hypothèses et des simulations inhérentes à la modélisation macroéconomique incite à la prudence dans la traduction directe des résultats théoriques en impacts réels. Malgré ces limites, nos résultats confirment qu'une concurrence plus efficace - telle qu'elle est représentée par les marges - profite à l'économie par le biais de différents facteurs, et en particulier en freinant l'inflation, en favorisant une augmentation de la consommation et en incitant les entreprises à réaliser de nouveaux investissements. Nos résultats montrent également que, bien que des gains non négligeables puissent être obtenus dans un délai relativement court, il faudrait un effort à long terme pour compenser la perte causée par la récente hausse des marges.

Dans l'ensemble, notre étude montre que, en moyenne, la concurrence sur les marchés de l’UE peut s'être affaiblie ; en outre, elle fournit des preuves originales des avantages multiples de la concurrence, dont il a été démontré qu'elle améliorait les services pour les consommateurs, renforçait la compétitivité des entreprises nationales sur les marchés internationaux et, plus généralement, contribuait à la croissance économique et au bien-être de la société. Ces avantages sont considérables et invitent les décideurs politiques à les prendre en considération lorsqu'ils décident des objectifs politiques à privilégier.

Kurzfassung

Die Generaldirektion Wettbewerb der Europäischen Kommission (GD COMP) hat das von Lear geführte Konsortium mit E.CA Economics, Fideres, Prometeia, University of East Anglia und Verian (im Folgenden gemeinsam das „Projektteam") beauftragt, eine Studie durchzuführen, um empirische Evidenz zu bestimmten Aspekten der Lage des Wettbewerbs in der EU zu liefern und die Kosten mangelnden Wettbewerbs für die Gesamtwirtschaft abzuschätzen.

Wettbewerb ist ein dynamischer Prozess, bei dem Unternehmen um die Marktnachfrage konkurrieren. Wenn dieser Prozess effektiv ist, führt er in der Regel zu besseren Ergebnissen für Verbraucher. Eine höhere Wettbewerbsintensität auf einem Markt bringt Unternehmen dazu, härter um Kunden zu konkurrieren. Je nach Markt äußert sich dies auf unterschiedliche Weise, beispielsweise durch Preissenkungen, Verbesserungen der Produktqualität, Erweiterung des Angebots, um den Bedürfnissen der Kunden besser gerecht zu werden, sowie durch die Einführung inkrementeller oder disruptiver Innovationen. Ein wirksamer Wettbewerb trägt nachweislich zu Produktivität, Investitionen, Innovation und letztlich zu Wachstum bei.

Hintergrund der Studie ist eine wachsende wirtschaftswissenschaftliche Literatur, die in den letzten Jahren dokumentiert hat, dass in vielen entwickelten Volkswirtschaften eine Verschlechterung bestimmter Wettbewerbsindikatoren und verschiedener Messgrößen der Wirtschaftsleistung, die mit der Wettbewerbssituation zusammenhängen, zu beobachten ist. Insbesondere deutet die Literatur darauf hin, dass die Konzentration auf Branchenebene zugenommen hat, dass die Margen gestiegen sind, insbesondere bei den Unternehmen mit den ohnehin höchsten Margen, dass die Geschäftsdynamik nachgelassen hat und dass die Marktstrukturen symmetrischer geworden sind, sowohl hinsichtlich der Firmengröße als auch hinsichtlich der Margen der Unternehmen. Kapitel 1 der vorliegenden Studie untersucht diese Literatur und kommt zu dem Schluss, dass zwar keiner der oben genannten Indikatoren für sich genommen perfekt ist, sie zusammengenommen darauf hindeuten, dass der Wettbewerb in den Märkten der EU wahrscheinlich abgenommen hat.

Vor diesem Hintergrund soll die vorliegende Studie Aufschluss über vier wichtige Aspekte der Wettbewerbssituation in der EU geben. In Kapitel 2 werden sechs sektorale und länderübergreifende Preis-Konzentrations-Studien vorgestellt, die qualitative und - für den Luftverkehr und den Mobilfunk - auch empirische Evidenz dafür liefern, dass eine höhere Konzentration mit höheren Preisen einherzugehen scheint. Kapitel 3 befasst sich mit den sogenannten „Global Superstars" (d. h. den weltweit profitabelsten Großunternehmen) und beschreibt deren Profitabilität sowie die Markteintrittsbarrieren, die ihre führende Marktposition schützen. In Kapitel 4 wird die Bedeutung des Wettbewerbs auf den Binnenmärkten für die Wettbewerbsfähigkeit der europäischen Unternehmen auf den Exportmärkten untersucht. Hierbei wurde unter anderem eine Umfrage unter in der EU ansässigen Exportunternehmen durchgeführt. Im Kapitel 5 werden zunächst Markups für 117.000 Unternehmen aus 23 Mitgliedstaaten geschätzt. Auf dieser Grundlage wird simuliert, wie sich intensiver Wettbewerb auf den EU-Märkten auf das Wachstum des Bruttoinlandsprodukts (BIP), die Beschäftigung, die Investitionen, die Exporte und andere makroökonomische Indikatoren auswirken würde.

Die wichtigsten Ergebnisse jedes Kapitels werden im Folgenden detailliert beschrieben.

Die Markt- oder Branchenkonzentration gehört zu den am häufigsten verwendeten Wettbewerbsindikatoren, die ihrerseits die Marktergebnisse und insbesondere die Preise beeinflussen: Daher zielt Kapitel 2 darauf ab, die Rolle der Konzentration bei der Erklärung der beobachteten Preisunterschiede zwischen den Mitgliedstaaten in bestimmten Wirtschaftszweigen zu bewerten. Es zeigt sich, dass trotz mehr als 50 Jahre langen Bemühungen der Mitgliedstaaten, einen einheitlichen europäischen Binnenmarkt zu schaffen, bei einer überraschend großen Zahl von Produkten erhebliche Preisunterschiede zwischen den EU-Mitgliedstaaten bestehen. Diese Preisunterschiede deuten nicht darauf hin, dass die Binnenmarktpolitik nicht funktioniert hat, sondern vielmehr darauf, dass viele Faktoren, die sich auf die Preise auswirken, in den einzelnen Mitgliedstaaten unterschiedlich sind. Zu diesen Faktoren gehören Unterschiede in den Kosten, Steuern und Regulierungen, aber auch - am wichtigsten für die vorliegende Studie – die

Wettbewerbsintensität, die in diesem Kapitel durch verschiedene Indikatoren der Marktkonzentration abgebildet wird.

Der Einfluss der Marktkonzentration auf die Preise wird in der theoretischen und empirischen Literatur grundsätzlich bestätigt. Mehrere Studien deuten darauf hin, dass eine Zunahme der Konzentration ceteris paribus mit höheren Preisen einhergeht. Allerdings wird in der Literatur auch darauf hingewiesen, dass einfache Korrelationen zwischen Preis und Konzentration nicht ausreichen, um einen überzeugenden Kausalzusammenhang zwischen beiden herzustellen. Hierzu wären weitergehende und genauere empirische Analysen erforderlich.

Um die Ursachen für die Unterschiede in den Marktergebnissen (Preise und Qualität) zwischen den Mitgliedstaaten und insbesondere die Rolle der Konzentration zu untersuchen, wurden sechs Wirtschaftszweige für eine eingehendere Analyse ausgewählt: Luftverkehr, Mobilfunk, Bier, Hypotheken, Einzelhandel und Zement. Diese Branchen, die sowohl Business-to-Consumer- als auch Business-to-Business-Aktivitäten umfassen, wurden ausgewählt, da sie einen großen Einfluss auf die Wirtschaft haben und erhebliche Preisunterschiede zwischen den Mitgliedstaaten aufweisen.

Für den Luftverkehr und den Mobilfunkbereich führt die Studie eigene empirische Analysen durch, die Rückschlüsse auf einen kausalen Effekt der Marktkonzentration auf die Preise und andere Marktergebnisse zulassen. Für die anderen Branchen wird ein qualitativer Vergleich der Preise und ihrer wichtigsten Bestimmungsfaktoren durchgeführt. Generell lässt sich feststellen, dass die Marktkonzentration eine wichtige Rolle bei der Erklärung der Preisunterschiede zwischen den Mitgliedstaaten zu spielen scheint, auch wenn andere potenzielle Ursachen für die Heterogenität der Marktergebnisse ebenfalls berücksichtigt werden sollen.

Untersucht werden die Auswirkungen der Marktkonzentration auf Preise und Investitionen im Mobilfunkbereich. Die Ergebnisse deuten auf einen starken positiven Zusammenhang zwischen Preisen und Marktkonzentration hin. Die Preise in den USA sind im Vergleich zu denen in der EU, wo die Anzahl der Mobile Network Operators (MNOs) im Verhältnis zur Marktgröße wesentlich größer ist, deutlich höher. Märkte mit mehr Mobilfunknetzbetreibern (MNOs) weisen tendenziell niedrigere Preise auf, nach Berücksichtigung weiterer Faktoren. Insbesondere zeigt die Untersuchung, dass eine Erhöhung des Herfindahl-Hirschman-Index (HHI) um 1.000 mit einer Preiserhöhung von 11-18% einhergeht. Die Rolle von Betreibern ohne eigene physische Netze, sogenannten Mobile Virtual Network Operators (MVNOs), sind sie nicht ausschlaggebend für die Preisunterschiede. Obwohl MVNOs tendenziell niedrigere Preise anbieten als ihre konkurrierenden MNOs, sind sie für die Preisunterschiede nicht ausschlaggebend. Der Grund könnte sein, dass MVNOs nicht mit MNOs um die gleichen Kunden konkurrieren. Bei der Betrachtung der Beziehung zwischen Investition und Konzentration stellt sich heraus, dass eine höhere Konzentration nicht zu höheren Investitionsniveaus führt. Darüber hinaus spielen MVNOs eine bedeutende Rolle bei der Förderung von Investitionen in die mobile Telekommunikation.

Für den Luftverkehr deuten die durchgeführten Analysen im Einklang mit der Literatur darauf hin, dass die Marktstruktur einen starken Einfluss auf die Preise hat, die in Märkten mit höherer Konzentration deutlich höher sind. Dieses Ergebnis wird sowohl durch eine Panel-Regressionsanalyse auf einem umfassenden Datensatz europäischer und US-amerikanischer Strecken als auch durch eine Eventstudie bestätigt, die den Marktaustritt einer führenden europäischen Fluggesellschaft nutzt, um den kausalen Effekt der Marktkonzentration auf die Preise zu bestimmen. In der letztgenannten Analyse wird insbesondere festgestellt, dass die durch den untersuchten Marktaustritt verursachte Konzentrationszunahme auf vielen Strecken mit einem unmittelbaren Anstieg des Preisniveaus um ca. 19,4 Prozent einhergeht.

Für Bier, Hypothekendarlehen, modernen Verbrauchereinzelhandel und Zement wird jeweils eine Untergruppe von EU-Ländern ausgewählt und die Preisunterschiede zwischen ihnen sowie die Unterschiede in den relevanten Preisdeterminanten, einschließlich der Konzentration, analysiert. Wir stellen fest, dass die Unterschiede zwischen den niedrigsten und höchsten Preisen in unseren Stichproben bei etwa 66 Prozent für Bier, 37 Prozent für

Hypotheken, 38 Prozent für den modernen Einzelhandel und 80 Prozent für Zement liegen. Insgesamt lässt sich feststellen, dass Kostenunterschiede die beobachteten Preisunterschiede zwischen den Ländern nicht zu rechtfertigen scheinen; Regulierung kann ein Faktor sein, der dazu beiträgt, und Konzentration kann ebenfalls ein Faktor sein. Spezifisch wird Folgendes für die unterschiedlichen Sektoren festgestellt:

- Für Bier sind die Preise in Deutschland um 66 Prozent niedriger als in anderen Ländern in unserer Stichprobe, und der deutsche Markt scheint wettbewerbsintensiver zu sein, was sich in einem geringeren Konzentrationsgrad widerspiegelt;
- Bei den Hypotheken weisen konzentriertere Märkte tendenziell höhere Hypothekenzinsen auf, wobei die Zinssätze um bis zu 0,71 Prozentpunkte voneinander abweichen, obwohl auch unterschiedliche Risikoniveaus für einige dieser länderübergreifenden Differenzen verantwortlich sein können;
- Im Einzelhandel (vor allem Supermärkte) sind die Preise in Ländern mit höherer Konzentration tendenziell höher. Unterschiede in der Regulierung scheinen nicht mit Preisunterschieden zusammenzuhängen. Die Komplexität dieser Märkte schränkt den Umfang ein, in dem die Analyse alle relevanten Ursachen für Preisunterschiede erfassen kann;
- Bei Zement scheinen höhere Preise mit einem höheren regionalen Konzentrationsgrad und möglicherweise auch mit nationalen Regulierungsstandards zusammenzuhängen.

Trotz der Bemühungen, eine gute geografische Abdeckung und Größenverteilung der Länderstichproben zu gewährleisten, sei angemerkt, dass die Ergebnisse der vier oben beschriebenen Studien von der Auswahl der Länder abhängen können. Generell muss betont werden, dass aufgrund der fehlenden Kausalanalyse (für Bier, Hypothekendarlehen, Einzelhandel und Zement) große Vorsicht geboten ist, um eine Überinterpretation der Ergebnisse zu vermeiden. Insgesamt unterstützen jedoch die ökonomische Theorie, frühere empirische Arbeiten und die hier vorgestellten eigenen Studien die Idee eines positiven Zusammenhangs zwischen Marktkonzentration und Preisen. Soweit die Ergebnisse auf andere Branchen übertragbar sind, bestätigen sie, wie bedeutsam es ist, die in Kapitel 1 beschriebenen Trends zunehmender Konzentration sorgfältig zu untersuchen.

Kapitel 3 untersucht Aufstieg und Beständigkeit der größten und profitabelsten Unternehmen der Welt, die als „Global Superstars" bezeichnet werden. "Superstar"-Unternehmen sind bereits seit Jahrzehnten Gegenstand wirtschaftswissenschaftlicher Studien. Die Debatte wurde aber durch neuere Untersuchungen belebt, die aufsteigende Margen und höhere Konzentration hinweisen, insbesondere am oberen Ende der Verteilung, wie in Kapitel 1 beschrieben.

„Global Superstars" wurden als die 50 profitabelsten Unternehmen unter den umsatzstärksten Unternehmen der Welt für fünf Fünfjahreszeiträume zwischen 1998 und 2022 definiert. Als Datensatz wurde Fortune Global 500 verwendet und die Analyse damit auf die 500 umsatzstärksten Unternehmen der Welt beschränkt. Innerhalb dieser Gruppe wurden Global Superstars als die Unternehmen mit dem höchsten kombinierten Wert aus Gewinn und Profitabilität (Gewinn/Umsatz) ausgewählt.

Selbst unter der globalen Elite der Fortune Global 500-Unternehmen ragen die Global Superstars heraus:

- Global Superstars erwirtschaften beträchtliche Gewinne: Ihr durchschnittlicher Jahresgewinn betrug im letzten betrachteten Zeitraum 14.5 Milliarden US-Dollar. Dies steht im Vergleich zu 3.5 Milliarden US-Dollar für andere Fortune-Global-500-Unternehmen;
- die Profitabilität der Global Superstars stieg stark an: Ihre Gewinnrate relativ zum Umsatz hat sich in den letzten 25 Jahren fast verdoppelt und ist von 11 % im Jahr 1998 auf 20 % im Jahr 2022 gestiegen, während es für das durchschnittliche Fortune Global 500-Unternehmen nur einen geringen Anstieg gab. Dies führt zu einer wachsenden Kluft zwischen den Gewinnen von Global Superstars und anderen Fortune Global 500-Unternehmen;

- die Gewinne konzentrieren sich ganz oben: Selbst unter den Global Superstars gibt es eine ausgeprägte und wachsende Kluft zwischen dem „durchschnittlichen Superstar" und den allerprofitabelsten Unternehmen. Die Unternehmen an der Spitze der Global Superstar-Liste sind deutlich profitabler als die anderen Global Superstars und haben ihre Gewinne in den letzten Jahrzehnten deutlich stärker gesteigert.

Die geografische Herkunft der Global Superstars wurde ebenfalls untersucht. Es zeigt sich, dass etwa die Hälfte der Global Superstars in den USA angesiedelt ist. In China sind immer mehr Global Superstars ansässig, da die größten chinesischen Unternehmen die Liste anführen. Der Anteil der Global Superstars mit Sitz in der EU und im Vereinigten Königreich ist in den letzten 25 Jahren zurückgegangen.

Mit Blick auf die Branchen der Global Superstars zeigt sich, dass sie in vielen Branchen aktiv sind. Die Verteilung der Global Superstars über die Branchen hinweg hat sich im Laufe der Zeit erheblich weiterentwickelt: Beispielsweise sind IT-Unternehmen (einschließlich Hardware, Software und Internetdienste) zunehmend an die Spitze der Verteilung vertreten, während Bergbau, Öl- und Energieproduktion an Bedeutung verloren haben. Pharmaunternehmen haben durchgehend einen hohen Anteil unter den Global Superstars.

Insgesamt ist bei den Global Superstars eine geringe Fluktuation festzustellen. Die profitabelsten Unternehmen der Welt sind in den letzten 25 Jahren erstaunlich stabil geblieben, insbesondere in den Bereichen Konsumgüter und Pharma: 11 Unternehmen wurden in allen untersuchten Fünfjahreszeiträumen zu den 50 profitabelsten Unternehmen gezählt (Coca-Cola, Intel, Johnson and Johnson, Microsoft, Nestle, Novartis, Pfizer, Philip Morris, Procter and Gamble und Roche). Weitere 13 Global Superstars werden in vier der fünf untersuchten Fünfjahreszeiträume gelistet. Interessanterweise sind 7 dieser 24 beständigen Unternehmen Pharmaunternehmen.

Die Tatsache, dass die Global Superstars solch enormen Gewinne anhäufen, wirft die Frage auf, warum diese Gewinne nicht von Wettbewerbern wegkonkurriert werden. Als eine mögliche Ursache wurde untersucht, ob Markteintrittsbarrieren die Global Superstars vor Wettbewerb schützen. Diese Analyse ist eher qualitativer Natur, da die Untersuchung weltweit in sehr breiten Branchen - Konsumgüter, IT und Pharma - durchgeführt wurde, während Eintrittsbarrieren nur für bestimmte geografische und Produktmärkte identifiziert werden können.

Im Konsumgüterbereich dürften die Global Superstars von Markentreue, Produktdifferenzierung und Skaleneffekten sowie möglicherweise auch von Verbundvorteilen aufgrund ihres Markenportfolios profitieren. Die meisten Global Superstars investieren stark in ihre Marken und andere immaterielle Vermögenswerte, die in einigen Fällen zu unverzichtbaren Marken für Einzelhändler geworden sind. Folglich stellt die Kombination aus Markentreue und Größenvorteilen Markteintrittsbarrieren dar, die wahrscheinlich die Umsätze und Gewinne der Global Superstars vor potenziellen Markteintritten schützen.

Im IT-Sektor dürften die Global Superstars von direkten und indirekten Netzwerkeffekten, Größen- und Verbundvorteilen sowie dem Vorhandensein proprietärer Technologien profitieren. Strategisches Verhalten könnte auch dazu beigetragen haben, Global Superstars vor Wettbewerb zu schützen. Auch wenn Marktneulinge in der IT-Branche in den letzten zwei Jahrzehnten eine aktivere Rolle gespielt haben als in der Konsumgüter- und Pharmabranche, bleibt abzuwarten, ob sie auch in Zukunft in der Lage sein werden, eine ähnlich wichtige disruptive Rolle zu spielen.

Im Pharmabereich sind die Global Superstars durch Patente geschützt; und in einigen Fällen durch das strategische Verhalten von Unternehmen, das auf Merkmalen des Patent- und Regulierungsrahmens basiert. Einige Merkmale des Patent- und Regulierungssystems werden kritisiert, weil sie inkrementelle Innovationen zu stark schützen. Es würde den Rahmen dieser Studie sprengen, die Vor- und Nachteile der Systeme für geistige Eigentumsrechte im Detail zu analysieren, doch scheinen sie Markteintrittsbarrieren zu schaffen und etablierte Unternehmen gegenüber Neueinsteigern zu begünstigen.

Insgesamt bestätigen die Ergebnisse dieser Studie, dass (i) mehrere Treiber zum Aufstieg und Fortbestehen von globalen Superstars beigetragen haben und dass (ii) diese je nach Branche unterschiedlich ausgeprägt sind . Die Ursachenmischung ist stark von der Branche abhängig, wie es auch die wirtschaftswissenschaftliche Literatur nahelegt. Es ist jedoch wichtig, dass die Wettbewerbsbehörden eine sorgfältige Wachsamkeit walten lassen, um eine Festigung an der Spitze der Gewinnverteilung zu verhindern.

Das Ziel von Kapitel 4 ist es, die Auswirkungen des Wettbewerbs im Binnenmarkt (d.h. des Wettbewerbs innerhalb der EU-Märkte) auf die Exportleistung europäischer Unternehmen außerhalb der EU zu analysieren. Exporte außerhalb der EU repräsentieren etwa 15% des BIP für die Länder, die in der vorliegenden Studie berücksichtigt werden. Sie sind für die Volkswirtschaften der EU wichtig, und daher sollten Regierungen sorgfältig beobachten, wie Unternehmen weiterhin auf internationalen Märkten erfolgreich sein können. In Kapitel 4 wird der Zusammenhang zwischen inländischem Wettbewerb und Exportleistung näher untersucht, es werden die Kanäle ermittelt, die diese miteinander verbinden, und es werden neue Erkenntnisse zur Bewertung der Rolle der einzelnen Kanäle auf der Grundlage einer Feldstudie gewonnen.

Die einschlägige wirtschaftliche Literatur ist sich einig darin, dass effektiver Wettbewerb auf den inländischen Beschaffungsmärkten positive Auswirkungen auf die Exportleistung hat, die Preise senkt und die Qualität sowohl von physischen Inputs als auch von Dienstleistungen verbessert. Dies ermöglicht es EU-Unternehmen, die solche Inputs nutzen, wettbewerbsfähiger auf internationalen Märkten zu sein. In Bezug auf die Rolle des Wettbewerbs auf dem inländischen Markt der Exporteure sind die Erkenntnisse der wirtschaftlichen Literatur gemischt. Die meisten Forscher argumentieren, dass Unternehmen, die einem effektivem Wettbewerb heimisch ausgesetzt sind, bestrebt sein werden, effizienter zu sein. Sie werden ihr Angebot durch Innovation und Produktdifferentiation attraktiver für Kunden gestalten und somit besser gerüstet sein, wenn sie gegen ihre internationalen Konkurrenten antreten

Einige Autoren schlagen jedoch stattdessen einen zweiten Mechanismus vor, der in die entgegengesetzte Richtung geht und nach dem sich ein stärkerer Wettbewerb auf dem heimischen Markt negativ auf die Exporte auswirken kann, da er die Unternehmen daran hindert, die Größe zu erreichen, die es ihnen ermöglichen würde, auf den internationalen Märkten effektiv zu konkurrieren. Diese Beiträge plädieren für ein Eingreifen des Staates um Anreize für die Schaffung „nationaler Exportchampions" zu schaffen, selbst auf Kosten effektiver Fusionskontrolle.

Kapitel 4 bereichert die Debatte über die Rolle des heimischen Wettbewerbs für die Exportleistung durch eine Umfrage unter europäischen Exportunternehmen, die in den wichtigsten Exportbranchen tätig sind. Konkret wurde ein Fragebogen an 398 europäische Unternehmen verschickt, die entweder in den wichtigsten Exportbranchen jedes in die Studie einbezogenen Landes (Österreich, Belgien, Tschechische Republik, Frankreich, Deutschland, Italien, Polen, Rumänien, Spanien, Schweden und Niederlande) oder in den wichtigsten Exportbranchen der EU-27 insgesamt tätig sind. Die Stichprobe der Exporteure besteht hauptsächlich aus kleinen und mittelgroßen Unternehmen (74% sind KMU und mindestens 14% mittelgroße Unternehmen). Die meisten von ihnen sind relativ alte und etablierte Unternehmen (nur 2% der Unternehmen sind jünger als 10 Jahre), die in mehrere Länder außerhalb der EU exportieren (57% der Unternehmen geben an, in mehr als 5 Länder außerhalb der EU zu exportieren).

Das Ziel der Umfrage besteht darin, die Rolle und Relevanz der drei Faktoren für den Exporterfolg in den Inlandsmärkten zu bewerten, in denen die Befragten tätig sind. Diese Faktoren sind (i) Wettbewerb auf den inländischen Vorleistungsmärkten für physische Inputs, (ii) Wettbewerb auf den inländischen Vorleistungsmärkten für Inputdienstleistungen, und (iii) Wettbewerb auf dem inländischen Markt für das eigene Produkt. Tatsächlich betrachten die Befragten alle drei Faktoren als sehr wichtig für ihre Wettbewerbsfähigkeit und ihren Exporterfolg. Eine weitere bemerkenswerte Erkenntnis hinsichtlich der inländischen Vorleistungsmärkte für Waren ist, dass physische Inputs offenbar der wichtigste Faktor sind (für 80% der Befragten wichtig), gefolgt von Wettbewerb auf den inländischen Vorleistungsmärkten für Inputdienstleistungen und

Wettbewerb auf dem inländischen Markt für eigene Produkte (jeweils 67%). Jeder Faktor wird unten genauer erörtern.

84% der Befragten beziehen ihren Haupt-Physischen Input aus der EU, was dazu beiträgt zu erklären, warum der Wettbewerb auf den inländischen Vorleistungsmärkten für unsere Befragten von großer Bedeutung ist. Die Produktqualität ist die wichtigste Eigenschaft des Hauptinputs für Unternehmen, die ihren Haupt-Physischen Input aus der EU beziehen, gefolgt vom Preis. Dies gilt in allen Sektoren, in denen die Befragten aktiv sind. Der Wettbewerb unter den Lieferanten des Hauptinputs wird im Allgemeinen als effektiv wahrgenommen, insbesondere hinsichtlich des Preises.

Im Bezug auf die Vorleistungsmärkte für Dienstleistungen wurdefestgestellt, dass Transport und Logistik von den Befragten mit Abstand als am wichtigsten angesehen wird (94% halten es als wichtig), gefolgt von Energie (83%), IT- und Kommunikationsdiensten (77%) und Forschung und Entwicklung (71%). Der Preis der Inputs wird für die meisten Dienstleistungen als ein wichtiger Faktor wahrgenommen, der die Exportwettbewerbsfähigkeit beeinflusst. Dies gilt insbesondere für Dienstleistungen mit hoher Standardisierung wie Energie (82%), Transport und Logistik (75%) sowie Finanzdienstleistungen (70%). Für Forschung und Entwicklung (80%), kreative Inputs (74%) und Transport und Logistik (73%) wird die Qualität des Dienstleistungsinputs als sehr wichtig erachtet. Mehr als 50% der Befragten halten den Wettbewerb in jeder Dienstleistungsbranche für effektiv. Unter allen Dienstleistungen scheint Transport und Logistik diejenige zu sein, bei der der Wettbewerb als am effektivsten wahrgenommen wird.

Die Befragten berichten von einer vergleichsweise starken Konkurrenz auf dem heimischen Markt für ihre Produkte. 45% geben an, 4 bis 10 glaubwürdige Wettbewerber für ihre Produkte auf dem inländischen Markt zu haben; 30% geben an, mehr als 10 Wettbewerber zu haben; und nur 25% geben an, nur 3 oder weniger Wettbewerber zu haben. Die Befragten nehmen ein mittleres bis hohes Maß an Wettbewerb in den Aspekten wahr, die sie für ihren Erfolg auf dem inländischen Markt als am relevantesten erachten. Insbesondere Qualität ist der Haupttreiber für 55% der Befragten, gefolgt von Preis mit 27%, wobei der Preiswettbewerb ALS am intensivsten wahrgenommen wird. Die Ergebnisse variieren etwas je nach Branche, in der die Befragten tätig sind. In den Bereichen Chemie, Maschinenbau und Holz werden am wenigsten Wettbewerber angegeben: Etwa 40% der Befragten geben an, dass sie nur 3 oder weniger glaubwürdige Wettbewerber haben. Dies könnte daran liegen, dass Eintrittsbarrieren wie der Zugang zu Kapital und natürlichen Ressourcen in diesen Branchen relevanter sind.

Besonders relevant für die Theorie der "nationalen Exportchampions" wurde den Unternehmen in der Stichprobe die Frage gestellt, ob effektiver Wettbewerb auf dem inländischen Markt für ihre eigenen Produkte die Exportwettbewerbsfähigkeit verbessert oder nicht und wie. Die meisten Befragten gaben an, dass der inländische Wettbewerb einen positiven Einfluss auf die Exportleistung hat: 85% der Befragten gaben an, dass der inländische Wettbewerb Unternehmen dazu anspornt, die Produktqualität zu verbessern oder aufrechtzuerhalten, 84% gaben an, dass er Unternehmen dazu anspornt, die Effizienz zu steigern, und 78% berichteten, dass er die Innovation im Unternehmen förderte. Wesentlich weniger Befragte betonten einen negativen Einfluss, wobei nur 66% angaben, dass der inländische Wettbewerb die Größe der inländischen Geschäftsaktivitäten beschränkt und Unternehmen daran hindert, auf Exportmärkten erfolgreicher zu sein. Interessanterweise steigt der Anteil der Befragten, die der Meinung sind, dass der inländische Wettbewerb die Exportleistung verbessert, mit der wahrgenommenen Anzahl von Wettbewerbern auf dem inländischen Markt.

Insgesamt bestätigt das Ergebnis der Umfrage das von Autoren wie M. Porter und H. Simon postulierte allgemeine Prinzip, dass effektiver Wettbewerb "zu Hause" die Exportwettbewerbsfähigkeit der beteiligten Unternehmen stärkt. Die in der Literatur identifizierten Mechanismen werden ebenfalls weitgehend durch die Umfrageergebnisse bestätigt, da ein großer Teil der Befragten der Meinung ist, dass der Wettbewerb sie dazu anspornt, die Qualität zu verbessern, die Effizienz zu steigern und Innovationen voranzutreiben.

Kapitel 5 liefert neue Evidenz für die makroökonomischen Vorteile eines wirksamen Wettbewerbs für die Volkswirtschaft und zeigt, warum die Schwächung des Wettbewerbs auf den EU-Märkten zu bedenken geben sollte. Während verschiedene Aspekte dieser Entwicklungen diskutiert werden, einschließlich der betroffenen Sektoren und ihrer treibenden Kräfte, besteht ein Konsens darüber, dass eine Verringerung des Wettbewerbsniveaus negative makroökonomische Folgen haben kann, wie z.B. geringere Investitionen, sinkende Produktivität und sinkende Lohnkosten. Kapitel 5 versucht, eine Schätzung dieser nachteiligen Folgen auf der Grundlage einer Methodik zu liefern, die mikro- und makroökonomische Ansätze kombiniert und auf eigenen Schätzungen von Aufschlägen sowie einem makroökonomischen Gleichgewichtsmodell beruht.

Der erste Schritt der mikroökonomischen Analyse besteht darin, die Markups auf Unternehmensebene für 117.000 Unternehmen aus 23 EU-Mitgliedstaaten auf der Grundlage von Daten aus ORBIS zu schätzen. Wie im Kapitel 1 beschrieben, werden Markups in der wirtschaftlichen Literatur weit verbreitet verwendet, um den Grad des Wettbewerbs zu messen. Markups repräsentieren das Verhältnis von Preis zu Grenzkosten und können als Maß für Marktmacht interpretiert werden. Unter ansonsten gleichen Bedingungen ist zu erwarten, dass das Markup eines Unternehmens umso höher ist, je geringer der Wettbewerbsgrad ist. Im vollkommenen Wettbewerb entsprechen die Preise den Grenzkosten, was bedeutet, dass der Markup gleich 1 ist. Es wurde festgestellt, dass das durchschnittliche Markup europäischer Unternehmen zwischen 2012 und 2019 um 6,4% gestiegen ist. Im Jahr 2019 betrug das durchschnittliche Niveau 1,42. Unsere Schätzung des Markups scheint robust gegenüber Änderungen in der gewählten Methodik zu sein und stimmt mit den in der Literatur verfügbaren Schätzungen überein.

Der nächste Schritt besteht darin, ein makroökonomisches Gleichgewichtsmodell zu verwenden, um makroökonomische Ergebnisse wie das BIP, die Preise, die Beschäftigung, die Unternehmensgewinne und den Haushaltskonsum in zwei Szenarien zu vergleichen: (i) ein Benchmark- oder Baseline-Szenario, das den aktuellen oder einen vergangenen Stand des Wettbewerbs widerspiegelt, und (ii) ein Kontrafaktur-Szenario, das auf der Hypothese basiert, dass sich im Vergleich zum Baseline-Szenario nichts anderes als der Wettbewerbsgrad ändert. Der Unterschied zwischen den beiden Szenarien wird durch eine Änderung - oder Schock - im durchschnittlichen Wert der Aufschläge ausgelöst. Diese Änderung kann als Veränderung des Wettbewerbsgrades auf den Märkten in der EU interpretiert werden.

Es wurden verschiedene Basis- und kontrafaktische Szenarien in Betracht gezogen, wie im Folgenden beschrieben:

- Anwendung der empirischen Literatur, die einen Anstieg der Markups seit 2000 dokumentiert: Das historische Szenario geht von einem Markup-Schock in der Vergangenheit aus. Die zugrunde liegende Idee besteht darin, die kontrafaktische Entwicklung der EU-Wirtschaft ohne den beobachteten Anstieg der Markups zu simulieren, wobei alle anderen Faktoren konstant gehalten werden. Die Ergebnisse dieser Simulation sind ein Hinweis auf die Kosten der Schwächung des Wettbewerbs in den letzten zwei Jahrzehnten zu interpretieren. Unsere Ergebnisse deuten darauf hin, dass das BIP der EU im Jahr 2015 um über 4% und im Jahr 2020 um mehr als 5% hätte höher ausfallen können, wenn es den Anstieg der Markups um 7,54% im Zeitraum 2000-2015 nicht gegeben hätte;
- Aufbauend auf unseren Markup-Schätzungen geht das *Trimming-Szenario* davon aus, dass alle Markups über dem 97. Perzentils der beobachteten Markup-Verteilung begrenzt werden: Das kontrafaktische Szenario zeichnet sich durch durchschnittlich 8,45% niedrigere Markups aus. Es wird geschätzt, dass eine vergleichbare Senkung der Markups heute zu einem Anstieg des EU-BIP um etwa 2,5% und nach fünf bzw. um 4,2% zehn Jahren führen würde;
- Das *Konvergenz-Szenario* wird ebenfalls auf der Grundlage unserer Markup-Schätzungen berechnet: Es wird angenommen, dass die Markups in Ländern, deren Markups heute über dem EU-Durchschnitt liegen, gesenkt werden und sich dem EU-Durchschnitt annähern. Die Logik besteht darin, die Einführung wettbewerbsfördernder Reformen zu simulieren, die die Unterschiede im Wettbewerbsgrad zwischen den Mitgliedstaaten verringern. Dies würde zu einer aggregierten Reduktion der Markups

um 8,38% führen: Dies würde nach dem Modell zu einem Anstieg des realen BIP um 2,4% nach fünf bzw. um 4,1% zehn Jahren führen.

Schließlich untersucht Kapitel 5 empirisch den Zusammenhang zwischen Markups und der totalen Faktorproduktivität (TFP), die für den langfristigen Wohlstand einer Volkswirtschaft von entscheidender Bedeutung ist, und kommt zu dem Schluss, dass ein höheres Wettbewerbsniveau die TFP fördert. Es zeigt sich, dass in allen drei kontrafaktischen Szenarien die geschätzten Vorteile noch größer wären, wenn nicht nur die direkten Auswirkungen von Veränderungen im Markup, sondern auch die potenziellen indirekten Auswirkungen auf die TFP berücksichtigt würden.

Bei der Interpretation dieser Ergebnisse ist eine gewisse Vorsicht geboten. Wettbewerb ist ein komplexer und vielschichtiger Prozess, der je nach Markt unterschiedliche Formen annehmen kann. Eine genaue Messung ist eine schwierige Aufgabe, und jeder Proxy, der zu diesem Zweck verwendet werden kann, weist einige Unzulänglichkeiten auf. Markups sind keine Ausnahme: ihr Anstieg kann auf eine Zunahme der Marktmacht und damit auf einen schwächeren Wettbewerb, aber z.B. auch auf Effizienzgewinne zurückzuführen sein. Darüber hinaus ist aufgrund der Annahmen und Simulationen, die der makroökonomischen Modellierung zugrunde liegen, Vorsicht geboten, wenn es darum geht, theoretische Ergebnisse direkt in reale Auswirkungen zu übertragen. Trotz dieser Einschränkungen deuten unsere Ergebnisse jedoch darauf hin, dass ein intensiverer Wettbewerb auf den Märkten in der EU - wie er durch niedrige Markups simuliert wird – zu verschiedenen Vorteilen für die Wirtschaft führen würde, insbesondere durch die Dämpfung der Inflation, die Förderung eines höheren Konsums sowie höhere Unternehmensinvestitionen.

Obwohl in relativ kurzer Zeit einige Gewinne erzielt werden könnten, zeigt es sich aus, dass ein langfristiges Engagement erforderlich wäre, um die durch den Anstieg der Markups verursachten Verluste auszugleichen.

Insgesamt zeigt dieser Bericht, dass der Wettbewerb durchschnittlich über die Märkte in der EU hinweg abgenommen hat; gleichzeitig liefert sie somit neue Evidenz für die vielfältigen Vorteile des Wettbewerbs, der zu besseren Ergebnissen für die Verbraucher führt, sowie die Wettbewerbsfähigkeit inländischer Unternehmen auf internationalen Märkten stärkt und zu einer beträchtlichen Steigerung der Wohlfahrt beiträgt. Solche Vorteile erweisen sich als erheblich und drängen die politischen Entscheidungsträger dazu, sie sorgfältig zu berücksichtigen, wenn sie darüber entscheiden, welche politischen Ziele Priorität haben sollten.

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1 Introduction and background to the study

A consortium comprising Lear, E.CA Economics, Fideres, Prometeia, the University of East Anglia and Verian (hereinafter, collectively, the "Project Team"), and led by Lear, has been appointed by the Directorate-General for Competition of the European Commission (hereinafter "DG Comp") to carry out a study to provide factual evidence on certain aspects of the state of competition in the EU and to estimate the cost of non-competition to the wider economy.

The background to the study is an emerging economic literature that has in recent years pointed at an increase in the level of industry concentration, increased industry markups and lower business dynamism in western economies. These are commonly considered to be indicators of the level of competition, which in turn is associated with better outcomes for consumers and the economy. Competition leads to lower prices, higher quality goods and services, greater variety, and more innovation. It contributes to fairness and growth. Yet, the process and intensity of competition are hard to capture, making each indicator of competition somewhat imperfect. By collecting evidence on different aspects of competition, one can however contribute to assessing its state.

This study seeks to understand more about the state of competition in the EU by:

- establishing how market concentration can be used to measure competition and to shed light on its relationship with price and other outcomes in six sectors of economic activity: airlines, telecom, mortgages, cement, beer and grocery retailing (chapter 2);
- looking at the world's largest and most profitable firms, to study how these firms at the top of the turnover and profit distribution have evolved over the last decades and gain a better understanding of the barriers to entry and expansion they may benefit from (chapter 3);
- exploring the role that domestic competition plays in determining the competitiveness of European firms in export markets, also by means of a survey among extra-EU exporters (chapter 4);
- estimating markups of 117,000 firms from twenty-three Member States to simulate how Gross Domestic Product (GDP) growth, employment, investment, exports and other macro-economic indicators would be impacted by more effective competition (chapter 5).

The remainder of this chapter sets out the background to the study, first by documenting the mechanisms through which competition (or lack thereof) affects the economy, and the associated empirical evidence (section 1.1); then, by describing the various approaches that are routinely used in the economic literature and/or by practitioners to measure competition (section 1.2); finally, by providing an account of the trends observed with respect to the state of competition in advanced economies, and in the EU especially (section 1.3).

1.1 How competition affects the economy

Competition is a dynamic process of rivalry in which firms vie for market demand. When effective, this process usually leads to better outcomes for customers. A greater level of competitive intensity in a market compels firms to compete more fiercely for customers: this can manifest in various ways depending on the market, including driving prices down, enhancing product quality, increasing variety to better meet the needs of customers, and introducing incremental and/or disruptive innovation. When competition is effective, firms cannot raise prices, or cut quality of services, without losing substantial business. Effective competition thus identifies a situation where firms strive to win customers by proposing a better offer and outcompeting rivals.

More formally, according to economic theory, a perfectly competitive environment is one where an infinite number of producers sets prices at the lowest level that allows to stay in the market, i.e. a price equal their marginal cost of production, meaning that economic profits are equal to zero. On the other end of the spectrum, a monopoly is a market where the monopolist is able to set the price that maximises its profits, which will typically be much larger than the marginal cost. In between these extremes, where most real-life markets lie, producers enjoy a certain degree of market power, which entails that producers are able to set prices above marginal costs, albeit not to the extent that a monopolist would.

The main beneficiaries of effective competition are customers. Businesses are themselves customers as they purchase intermediary goods and services that are used in their productive process. Therefore, they benefit from competition among their suppliers, through lower prices or better quality for the factors of productions which can, in turn, be passed on to final consumers.

Box 1.1: Price-concentration studies

Chapter 2 of the study will analyse the relationship between market outcomes, notably prices, and concentration in six sectors of economic activity. Both business-to-consumer and business-to-business sectors were selected for these analyses, namely: airlines, telecom, mortgages, cement, beer and grocery retailing. The methodological premise to these studies is that the sector or market concentration provides a useful approximation of the level of competition and market power. Concentration indexes are, indeed, among the most widely used structural indicators of competition (see section 1.2). Through econometric and descriptive analyses, the chapter will seek to explain if and to what extent price differences across countries (or markets more generally) can be traced back to differing levels of concentration.

Source: Project Team

Besides, several historical cases support the idea that weak competition has negative implications on a variety of market outcomes, as described in Box 1.2.

Box 1.2: A review of the literature on the effects of legal cartels

The United States' National Industrial Recovery Act (NIRA) of 1933 allowed firms to establish "codes of fair competition". These codes included agreements among businesses within an industry to regulate prices, production levels, and working conditions and were enforceable by law. Eventually, the NIRA was ruled unconstitutional in 1935.

Several studies show evidence of less favorable outcomes when NIRA was in place:

- Alexander (1994) finds significant correlation between an industry's 4-firm concentration ratio and its price-cost margin prior to the NIRA; this correlation decreased when the NIRA was in place. Cartelization, therefore, weakened the relationship between market structure and margins, suggesting reduced competitive pressure;
- Chicu et al. (2013) finds that, before the NIRA, the costs of a cement plant's nearest neighbour had a positive effect on a plant's own price; this effect decreased when NIRA was in place, consistently with NIRA reducing the intensity of competition;
- Vickers and Ziebarth (2014) find that while the policy was in effect, prices became less responsive to changes in cost, the dispersion of prices across firms decreased, and the persistence in prices increased (i.e. prices remained relatively more stable over time than before), consistently with effective cartelization.

The economic literature also shows that this policy experiment was harmful for the economy: Taylor (2002, 2010) shows that NIRA brought about a reduction in manufacturing output and generally harmed economic welfare; Cole and Ohanian (2004) perform a general equilibrium analysis and directly attribute the weak recovery of the 1930s to the NIRA's cartelization.

After the Second World War, for several decades, cartels were legal in Finland. Hyytinen et al. (2018, 2019) find that, by the end of the period they analyse (1951-1992), most manufacturing industries were cartelized, with collusion taking various forms, including fixing prices, allocating markets and/or setting quotas. Since not all industries had cartels and, even in cartelized industries, some cartels were never registered, the authors build a model to estimate how the likelihood of having a cartel relates to certain industry characteristics and macro variables. They find that the more likely an industry is to have a cartel, the higher its price-cost margin, suggesting that these legal cartels indeed raised prices.

Similarly, Ciarreta (2012) estimates the effects of a combination of regulation and competition policy allowing for cartels formation in Sweden; the author finds that prices were higher on average in those markets affected by horizontal collusion, and real sales were lower.

These episodes can be considered natural experiments that allow to estimate the benefits of effective competition for the economy: when competition is weak, indeed, firms are more likely to collude. They also provide, however, an indication of the benefits of effective competition law.

Source: Project Team

There are various channels through which changes in the degree of competition affect economic performance, both at the microeconomic and at the macroeconomic level. At the microeconomic level, competition can affect productivity through its impact on: (i) productive efficiency, i.e., increasing firm productivity; (ii) allocative efficiency, i.e., favouring an optimal allocation of resources; and (iii) dynamic efficiency, i.e., providing the incentive for firms to innovate. All these mechanisms lead to a reallocation of sales

to more productive firms ("selection effect" of competition): the competitive process facilitates a selection mechanism that rewards those firms that are capable of meeting market demand, and marginalizes the others, or forces them to exit the market, thus leading to a more efficient allocation of resources in the economy. Efficiencies are often associated with better outcomes for consumers, in that they may be passed on by firms to their customers through lower prices or better quality. These microeconomic effects have a macroeconomic impact on aggregate productivity and growth, but also on income distribution (e.g., through changes in the labour and capital shares of income). The purpose of the remainder of this section is to review the literature that has documented the relationship between competition and various outcomes both at the micro- and at the macro-level.

Box 1.3: Welfare standards

From a policy perspective, the evaluation of the impact of competition depends on the welfare standard that is adopted. Economic welfare is a concept that is used to measure the performance of an industry. Total welfare is an aggregate measure of the welfare of different groups of economic agents: consumer welfare and producer welfare. Consumer welfare is a measure of the difference between the price paid for a good and consumers' willingness to pay, which reflects their valuation of the good. Consumer welfare thus increases when, *ceteris paribus*, prices decrease and quality increases. Producer welfare reflects the profits made through the sale of the goods.

Although the two can be aligned, this is not always the case. For instance, a merger that allows the merging parties to reduce their fixed costs might increase total welfare if the cost reduction is significant, even in the presence of a price increase due to unilateral effects which decreases consumer welfare. Further, these welfare standards do not capture all the potential effects of competition on the economy; in particular they do not capture redistributive effects, i.e. the distribution of income between workers and producers.

The remainder of the discussion in this section seeks to establish all the possible mechanisms whereby competition can affect the economy, regardless of whether they would be relevant or not under a certain welfare standard.

Source: Project Team

1.1.1 Impact at the microeconomic level

Competition affects economic performance at the microeconomic level through three mechanisms that impact firms' efficiency.

First, competition acts as a disciplining device for firms and their managers, placing pressure to reduce within-firm inefficiency (also referred to as x-inefficiency[1]), given the current state of technology and consumer preferences: when competition is effective, firms will have strong incentives to undertake any action that allows them to achieve

[1] *x-inefficiency occurs when a firm lacks adequate external incentives to regulate its production costs, thereby potentially reducing its average production costs. The term comes from the use of equations in economic models, where output, denoted by "y", varies along with the factors of production, denoted by "x".*

cost savings. The urge to do so will be much lower when competition is weak, as the risk of losing market demand is less compelling.[2]

The theoretical literature on this channel has been discussed, *inter alia*, by Willig (1987), Ahn (2001), and Bloom and Van Reenen (2010). Empirically, Nickell et al. (1997) identify this effect in UK manufacturing companies: they find that average profit margins – which, to some extent, can be interpreted as a proxy for the level of competition that firms face, as will be discussed more thoroughly in section 1.2 – are negatively related to productivity growth, suggesting that a lower level of competition has a detrimental impact on productivity, often used to measure efficiency.[3] The authors argue that competition acts as a "disciplining device", putting pressure on managers and, in particular, that when competition is effective: it is easier for the owners to monitor managers' behaviour, as the opportunities for comparing their managers' effort with others may be enhanced, which in turn can lead to sharper incentives; and the probability of bankruptcy increases, thereby stimulating the managerial effort. Griffith (2001) performs a cross-industry analysis covering the UK over the period 1980-1996 and finds that an increase in competition, induced by a change in regulation, was associated with an increase in productivity; this result was driven by an increase in managerial effort.[4] [5]

Second, competition fosters allocative efficiency, i.e. the allocation of resources in the economy that maximises total welfare, given the current state of technology and consumer preferences. Perfect competition equilibria are allocatively efficient: in this scenario – where, as described above, prices equal marginal costs of production – production and consumption choices reflect the costs of producing a good, including the opportunity costs.[6] The opportunity cost of engaging in a productive activity includes the loss of the utility that would have been obtained through a different allocation of the resources adopted in the productive process; similarly, for a consumer the choice to consume a good entails the loss of the utility linked to a different consumption choice. Allocative efficiency thus implies that it is not possible to shift resources from one productive activity to another in a way that increases welfare; and that, in particular, it is not possible to make a consumer better off without making another consumer worse off.

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[2] This effect is particularly relevant when ownership and management of a firm are separated. In these cases, a principal-agent problem may arise: there may be a conflict of interest between owners and managers, in that managers (the agents) may slack and the owners (the principals) cannot perfectly monitor the managers' effort (see, for instance, Hart (1983)). The strength of this effect is limited when managers' remuneration is linked to a firm's profits.

[3] Productivity is a measure of the output produced with a given set of inputs. One widely used measure of productivity is Total Factor Productivity ("TFP"). TFP is the ratio between the level of total output and the amount of inputs employed to produce it, including both labour and capital inputs. The authors identify a negative relationship between level of rents and productivity growth (10% increase in market power reduces TFP growth by 1.3-1.6 percentage points on average), as well as a long run negative impact of market share on productivity level (25% rise in market share leads to to a 1% decline in TFP).

[4] In particular, this effect was found only for those firms that are characterised by a principal-agent problem (i.e. separation of ownership and management).

[5] Bloom and Van Reenen (2010) find a positive relationship between competition and management quality, measured through an indicator constructed based on responses to a cross-country survey; the survey was meant to capture several aspects of management quality, including whether actions aimed at increasing efficiency were adopted. Bloom et al. (2012) extends the results of Bloom and Van Reenen (2010) also to the public sector.

[6] Formally, this is obtained when prices equal the marginal utility for consumers and the marginal cost of production.

Thirdly, competition may foster productivity by stimulating innovation (dynamic efficiency): taking a dynamic perspective, the state of technology is no longer a given; instead, it can be affected by innovation. The consensus on the direction of the nexus between competition and innovation is, however, not unanimous. On the one hand, in a competitive environment, firms invest more in innovative activities to differentiate their offer, gain an edge over their competitors and benefit from temporarily escaping competition (the "escape-competition effect").[7] On the other hand, some argue that "too much competition" can lead to lower levels of innovation and technological development: the underlying idea is that the incentive of laggard firms to engage in product or process innovation that would allow them to catch up with incumbents derives from the expectation of extracting profits from it; in markets with less competition, this incentive is stronger as the laggards will expect to enjoy a higher degree of market power (the "Schumpeterian effect"). In fact, the latter is the idea behind intellectual property rights protection – i.e. patents create incentives for firms to innovate by granting a period of "competition escape" and profit extraction.[8]

Aghion and Howitt (1992) argue that firms' expectation of future lower profits induced by more effective competition might act as a disincentive for investing in innovation and therefore have a negative impact on productivity growth. Instead, numerous other studies (see Porter, 1990; 2001, Syverson, 2004; 2011, Holmes, Levine, and Schmitz, 2012, and Bloom and van Reenen, 2010) suggest that firms facing effective competition have a larger incentive to innovate to keep or improve their market position. Griffith et al. (2010) provide empirical evidence of a positive relationship between innovation and competition: they find that increased product market competition, induced by the introduction of procompetitive reforms and measured by a reduction in average profitability, is associated with an increase in innovation intensity and productivity growth in manufacturing sectors.

These two different views have been, at least partially, reconciled by Aghion et al. (2005; 2009) who suggest an inverse U-shaped relationship between competition and innovation. Competition seems to spur innovation up to a saddle point, after which more competition becomes harmful for innovation. Polder and Veldhuizen (2012) and IMF (2019) provide empirical evidence in support of the existence of an inverse U-shaped relationship between markups (which can be interpreted as a proxy for the degree of competition, as will be explained in section 1.2) and innovation, respectively for Dutch firms and for a sample of firms from 27 countries.[9]

Further indication of a positive impact of competition on innovation is provided by empirical evidence on the relationship between innovation and openness to trade, since openness to trade is one of the numerous mechanisms that impact competition

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[7] See Cohen (2010) and De Bondt and Vandekerckhove (2012) for a more comprehensive description of dynamic efficiency.

[8] The evidence on whether stronger patent protection (longer patent terms or broader patent scope) induce additional research investments is not conclusive. However, there is evidence that pharmaceutical patent protection shortens the time span before new drugs become commercially available (Kyle and Qian, 2014; Cockburn et al., 2016). Moreover, Correa and Ornaghi (2014) show that in the US manufacturing competition goes hand in hand with innovation measured by patent statistics, given that there is a market with clear intellectual property rights. Similarly, Aghion et al. (2018) provide evidence that product market reforms activated higher innovative investment in the EU manufacturing industries in countries with stronger patent rights.

[9] The impact of increased competition may also depend on the initial conditions in the market. Escaping competition through innovation may be particularly relevant in industries where firms are similar in their technological levels. However, in industries where there is a technology leader with a tail of less competitive firms, increased competition may, in theory, lead to lower innovation activity (Aghion et al., 2005).

intensity. Exposure to trade can increase competition by broadening market scope and increasing the number of competing firms. Extensive empirical evidence shows that trade openness is related to innovation. At the firm-level, innovation has been shown to be positively correlated with: (i) improved access to foreign markets (larger markets increase the scale of production and revenues from innovation, motivating firms to incur the costs of implementing new technology or investing in R&D); (ii) imports of capital goods and intermediate inputs (cheaper imports raise productivity via learning, variety and quality effects); and (iii) import competition (which creates incentives for domestic firms to differentiate their products from those of new competitors from abroad).[10]

On balance then, the literature appears to suggest that effective competition can spur innovation.

Therefore, economic theory overall suggests that effective competition drives firms to be more efficient both in static and dynamic terms. Considering the dynamic nature of the competitive process, competition will reward the firms that are most effective and efficient in delivering what customers want. This occurs by reallocating sales to more efficient or, more generally, better performing firms, and eventually pushing the least efficient firms to leave the market.[11] Empirical evidence that reallocation of resources towards more productive firms is indeed correlated with competition is provided by Arnold et al. (2011). Disney et al. (2003) show that the exit of less efficient firms in favour of more efficient establishments accounts for the large part (80 to 90%) of productivity growth in the UK between 1980 and 1992.[12]

As argued in OECD (2014), the main reason why competition is found to foster productivity is the reallocation effect between firms. Several empirical studies confirm that this type of business dynamism induced by competition matters for productivity growth.

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[10] See WTO (2020, Section C.3(a)) for a detailed discussion and references. The third channel is ambiguous, because import competition erodes the profits of domestic firms, and hence their motivation and the availability of their internal funds to invest in innovation. While for European countries the evidence points towards a net positive impact of import competition (namely, from China) on innovation (Bloom et al., 2016), for the United States there is evidence that Chinese import competition had a negative impact on innovation activity (Autor et al., 2020).

[11] This channel has been modelled for instance by Melitz (2003), Rossi (2019), and Casares et al. (2020).

[12] In particular, the authors measure productivity through TFP. Similar evidence is provided by Harris and Li (2008), who report how low productivity firms exiting the market explained aggregate UK productivity growth for non-exporting firms in the period 1996-2004; and by Baldwin and Gu (2003), who add evidence from Canada, where in the period 1979-1999 a vast part (70%) of TFP growth is attributable to higher productivity companies gaining market shares.

Box 1.4: Global superstars

The economic literature has documented the rise and growth of so-called superstar firms – firms that are exceptionally successful and have a position of prominence in the markets where they operate. This phenomenon may be the result of the selection effect of effective competition; but it may also be due to weak competition or to lax enforcement of competition rules. Whatever the reason behind this phenomenon, the existence of these superstar firms can be by itself a source of concern: those companies may be able to behave independently from competitive constraints and exercise market power; and their market position may be harder to challenge, making markets less dynamic. For these reasons, it is important to investigate recent developments that concern the world's largest and most profitable firms. Chapter 3 of the study assesses who Global Superstars are, how they have evolved over time, where they are active, where they come from, and how they differ from other firms in the same sector. And it discusses the possible causes of their rise and persistence, which might be both benign and anti-competitive.

Source: Project Team

All the channels described imply that effective competition fosters efficiency. The economic literature provides overwhelming empirical evidence of a positive relationship between competition and productivity, as a measure of efficiency, independently from the underlying channel at play.[13] In a seminal paper, Haskel (1991) uses panel data on UK firms from 1980 to 1986 to show a negative effect of market concentration (another proxy for competition) on productivity. Subsequent studies documenting a positive impact of competition on firm productivity in different countries include, among several others, Ospina and Schiffbauer (2010), Carvalho (2018), Opoku et al. (2020), Ganglmair et al. (2020), and Rodríguez-Castelán et al. (2020).[14] This evidence is complemented by studies finding a positive link between competition and aggregate sector-level productivity.[15]

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[13] The CMA (2015) performs an extensive review of the findings of the empirical economic literature on the relationship between competition and productivity.

[14] Working with data from the World Bank Enterprise Survey from 2004, Ospina and Schiffbauer (2010) show that firms with markups above the 80th percentile have on average 8% lower labour productivity and 1.2% lower TFP level. Using panel data for Portuguese firms between 2010 and 2015, Carvalho (2018) finds that a 1% higher concentration, measured by the HHI, leads to a contraction in companies' productivity of an average 1.1-1.3 percentage points. A similar linkage is documented in Opoku et al. (2020) is a sample of firms from 139 countries. Ganglmair et al. (2020) estimate that a 1% increase in the lagged markup of German firms lowers their total factor productivity by 1.5%. Rodríguez-Castelán et al. (2020) relate individual TFP levels of Mexican firms to sectoral-geographical competition measured by HHI. They find that a decrease in the HHI by 10% causes a 1% increase in revenue productivity. See section A.4.2 in European Commission (2021) and for more references.

[15] Nicoletti and Scarpetta (2003) find that entry liberalizations in OECD countries have about 0.1-0.2 percentage points annual productivity growth impact in services, while removing the level of barriers to entry in some European countries towards to the OECD average would have stimulated annual MFP growth by 0.1-0.2 percentage points. Ambashi (2013) exploits Japanese sector-level panel data between 1980 and 2008 to show that competition (calculated by the Lerner index) has a positive effect on TFP growth in manufacturing, although for non-manufacturing industries this relationship turns negative in the last part of the period. Bourlès et al (2013) provide evidence from a panel of 20 industries and 15 OECD countries between 1985 and 2007 that that the elimination of anti-competitive regulation in upstream service sectors could increase yearly TFP growth by 1-1.5 percentage points. Focusing on 22 industries in OECD countries over the period 1995 to 2005, Buccirossi et al. (2013) find a positive and significant effect of competition policy indicators on productivity growth.

By stimulating productivity and improving firms' performance through various channels, competition can also foster export competitiveness: firms that are subject to effective competition in their domestic market will strive to be more efficient, to make their offer more attractive for customers through innovation and product differentiation, and will thus be better equipped to successfully compete against their rivals in international markets.

Box 1.5: Domestic competition and export performance

The literature has examined the relationship between domestic rivalry and export performance and has put forward two opposite views: one supporting a "national champion" argument, whereby firms' international competitiveness would benefit from less domestic competition; the other suggesting that domestic competition stimulates firms' export competitiveness. Chapter 4 of the study provides its contribution to this stream of literature, exploring how domestic competition, i.e. competition in the EU internal markets, affects export performance. It develops an analytical framework on how competition at home, or the absence thereof, may affect the ability of EU firms to compete successfully on the global stage. It does so with the support of a literature review that helps identify the channels linking domestic competition and export performance. The chapter also relies on survey evidence gathered from companies active in the top European export sectors, instrumental to test the relevance of the channels identified through the literature. Their assessment is directly relevant to the question of whether protecting competition in the internal EU markets may have undesirable effects on export performance, by curbing the scale of European companies, and putting them at a disadvantage in international markets.

Source: Project Team

1.1.2 Impact at the macroeconomic level

The positive impact of competition on productivity at the microeconomic level translates into greater productivity in the wider economy, which is an important driver of welfare and economic growth.[16]

A large body of literature, using various methodologies, points to significant benefits to the economy in terms of productivity and GDP growth from more competitive market structures, which are expected to influence the level of competition. Studies such as Bailey (1993), Dutz and Hayri (1999), and Clougherty and Zhang (2009), using cross-country comparisons, argue that the intensity of domestic competition positively affects productivity and GDP per capita growth. Similar conclusions are reached in studies exploiting countries' (or regions within countries') heterogeneity in market structures over time.[17] Pellegrino (2023) assesses the effect of an oligopolistic structure on welfare, as compared to a competitive counterfactual. He estimates that welfare costs of

[16] *Basu et al. (2012) show that productivity is one of the key determinants of the welfare of a nation.*

[17] *Zitzewitz (2003), for instance, empirically assesses the relationship between market structure and long-run productivity growth in the tobacco industry by performing a difference-in-difference analysis, exploiting specific features of the US and UK markets. These countries' industries had similar access to cigarette manufacturing technology but experienced competition and monopoly in different time intervals. The author estimates that during the competition periods productivity growth was overall higher than in monopoly periods.*

oligopoly in the United States increased from 7.8% in 1996 to 12.7% in 2019;[18] the estimated effects on consumer welfare are even larger.

Several papers have also sought to quantify the aggregate welfare losses associated with market power. Harberger (1954) proposes a methodology to estimate the deadweight losses associated with the exercise of market power as a function of changes in the levels of price and output. Using data from the 1920s for the United States, he calculated welfare losses equal to 0.1% of GDP. Several subsequent studies refined Harberger's methodology and estimated much larger welfare losses.[19] Summarizing the results of various studies, Baker (2003) argues that the costs to the economy from the exercise of market power are at least ten times larger than what Harberger's findings would suggest.

De Loecker et al. (2021) show that the welfare impact of an increase in market power depends on the mechanism that led to such an increase. Specifically, while higher margins that reflect reallocation of resources to more productive firms are associated with welfare gains, higher margins that reflect changes in the market structure are associated with welfare losses. Analysing US data between 1980 and 2016, they show that welfare gains due to technological change that reallocated sales to more productive firms (plus 9%) were more than outweighed by welfare losses due to less competition, i.e., the capacity of these most efficient firms to extract higher rents from consumers (minus 15%).[20]

A stream of literature, to which chapter 5 is closely related to, estimates the potential impact on welfare of reductions in market power measured through markups. Edmond et al. (2018) find that decreased competition accounted for two-thirds of misallocation of factors of production and the gain for the representative US consumer would be 7.5% in consumption-equivalent terms if all markup distortions were eliminated. Baqaee and Fahri (2020) argue that eliminating markups from each sector, bringing the US economy to a situation of perfect competition, would raise aggregate productivity by 10-25%. Forni et al. (2010), relying on a macro-modelling approach, show that more competition would increase long-run GDP and growth.

The intensity of competition has specific effects on the outcomes of the labour market. As established above, effective competition stimulates productivity: an increase in productivity that reflects an increase in the output produced per worker justifies a growth in real wages, as the value of the individual worker increased. De Loecker et al. (2020) discuss how increases in market power reduce wages, especially for low-skilled workers, thereby also increasing wage inequality. Azar et al. (2020) use data from the US and find that the higher the business concentration, the lower the wages offered.

This would suggest that wage growth should move together with productivity growth. Recent literature has, however, shown that wage growth has been lower than productivity growth, which has resulted in a decline in the labour share of income (OECD, 2018). According to the economic literature, this effect is also attributable to

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[18] Welfare costs of oligopoly are defined in Pellegrino (2023) as the percentage increase in aggregate surplus that would be obtained by moving to a competitive outcome, in which all firms behaved as atomistic competitors.

[19] See Baker (2003) and Huschelrath (2012) for reviews.

[20] As explained by De Loecker et al. (2021), increases in market power, per se, are not necessarily welfare-reducing, being determined by the interaction of technological change and change in the market structure. The welfare changes associated with an increase in market power depends on whether market power reflects the reallocation of resources towards more productive firms, in which case welfare increases, or whether market power, by reducing competition, creates deadweight losses, in which case welfare decreases.

the evolution of competition. By stimulating production of output through the channels described in section 1.1.1, effective competition stimulates job creation and increases the volume of employment. As explained by De Loecker et al. (2020), an increase in market power and the related fall in employment lead instead to a reduction in firms' demand for inputs, including labour, thereby lowering both real wages and the labour share, while increasing the profit share.

Several studies confirm that changes in market power are among the causes of observed reductions in the labour share. Using data on firms from 27 countries, IMF (2019) finds that rising markups have accounted for at least 10% of the decline in the labour share in the average advanced economy. A negative correlation between markups and labour shares is also documented by Eggertsson et al. (2021) in a quantitative model of the U.S. economy, and by De Loecker and Eeckhout (2018) for a sample of 59 countries;[21] the latter also show an increase in the profit share.[22] Similarly, Gutierrez (2017) empirically finds that the reduction in the labour share observed in the US is explained by declining competition. Ennis et al. (2019) suggest that the unequal distribution of profits from market power accounts for an increase in wealth inequality, increasing the wealth of the richest 10% of the population by between 12 and 21% for eight OECD countries.

Another potential channel through which increases in market power can negatively affect the economy is through aggregate investment.[23] The underlying mechanism is the same as the one described above for labour: higher market power leads to lower demand for capital by firms, and thus to a decline in aggregate investment. IMF (2019) argues that, for the group of advanced economies in their sample, aggregate capital stock would have been 3% larger had markups stayed constant.[24] Assuming a one-third elasticity of output to capital (i.e. when capital increases by 1% output increases by 0.33 %), this would have implied an output gain of about 1%.

The beneficial effects of competition on the economy are self-reinforcing. Competition can stimulate entrepreneurship or the creation of new businesses, which in turn makes the economy more competitive. Wennekers and Thurik (1999) show that entrepreneurship[25] has beneficial effects on two different measures of performance of economic activity: economic growth and reduction of unemployment. Galindo and Méndez (2014) show that there are feedback effects among innovation, economic growth and entrepreneurship. Innovation and entrepreneurship are closely related: innovation is instrumental to carry out entrepreneurship activity; entrepreneurs innovate and their innovations stimulate other entrepreneurs to carry out their activity, thus increasing the overall level of innovation in the economy. Innovation and entrepreneurship both generate higher levels of economic activity, by stimulating

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[21] In Eggertsson et al. (2021), the combined effects of a rise in markups and a decrease in the natural rate of interest are also assessed on the increase in the wealth-to-output ratio and the increase in the Tobin's Q ratio (the ratio between the market value of corporations and the replacement cost of their capital stock). Other studies showing that market power is associated with lower labour shares in the U.S. include Barkai (2020) and Autor et al. (2020).

[22] Proxied by the ratio between market valuation and sales.

[23] Theoretically, the decline in aggregate investment due to market power can be explained by lower demand for capital for firms whose market power increases.

[24] This result is obtained looking at the estimated elasticity of firm-level markups on firm-level physical capital investment.

[25] Measured as the relative share of economic activity accounted for by small firms or, alternatively, by the self-employment rate.

productivity and employment. They are, however, also influenced by economic growth: higher levels of economic growth generate new business opportunities and entrepreneurs might be interested in accessing new markets by supplying products with a higher degree of competitiveness, including through innovation. Savings play an important role, as both innovation and entrepreneurship are dependent on obtaining the necessary resources.

Further research focuses on the beneficial effects on the economy of the introduction of various types of pro-competitive policy interventions. If effective, these policies foster competition, so this body of literature provides further evidence of the benefits of more effective competition; and it can also be considered an indication of the importance of employing all the available policy instruments to promote competition. Barbero et al. (2022) quantify the macroeconomic impact of regulatory reforms introduced in the European Union between 2006 and 2017 that lowered barriers to entry in services markets. Their findings also suggest that policy interventions that increase the intensity of competition would lead to GDP growth.

Ciapanna et al. (2022) quantify the macroeconomic effects of three major structural reforms introduced in Italy in the last decade. Namely, the reforms analysed were meant to (i) liberalise the services sector, (ii) incentivise business formation and innovation by introducing fiscal incentives were adopted aimed at supporting start-ups and innovative small and medium enterprises, and (iii) increase courts' efficiency by reforming the civil justice system. The authors find that each reform has a positive impact on productivity and negative impact on markups and that these translate into significant long-run gains in terms of GDP.

In a similar vein, Pfeiffer et al. (2023) assess the benefits in terms of GDP of hypothetical structural reforms aimed at increasing competition intensity. In particular, they find that, if a country introduced reforms such that its overall regulatory framework converges to that of the most competitive EU countries, it would experience GDP growth.

The evidence on the beneficial effect of effective competition on the economy is thus extensive. This is per se evidence of the importance of competition policy, which has as its objective that of protecting effective competition. Among others, one of the means through which this objective is pursued is the existence and the enforcement of competition law. The economic literature also provides specific empirical evidence of the benefits of competition law enforcement for the economy.

Focusing on cartel cases investigated by the French Competition Authority, Moreau and Panon (2022) show that breaking down cartels in France would lead to a reduction in markup levels and increase aggregate productivity by 2% and welfare by 3.5%.[26] The authors obtain these findings by building a model of oligopolistic competition that allows for collusive behaviour and comparing the cartel and the competitive (i.e. one where all cartels are removed) equilibria. In a similar vein, Babina et al. (2023) estimate the impact of all 3,055 antitrust lawsuits brought by the US Department of Justice (DOJ) between 1971 and 2018 and find that these have contributed to persistently higher levels of economic activity and business formation. In particular they find that, as a result of the DOJ interventions, economic activity (measured as employment) increased

[26] *The authors motivate this finding noting that cartel members tend to be the top firms in their industry – a fact that they document empirically studying the characteristics of firms that were sanctioned by the French Competition Authority. This implies that breaking down cartels would reduce the prices they apply, thereby reallocating demand towards these large producers which are more productive.*

by 5.4% and business formation (measured as the number of active firms) by 4.1%.[27] The European Commission (2023) examines the impact of its own interventions:[28] it estimates a negative shock in market power associated to these interventions, which would have, in turn, a positive impact on real GDP, and this impact would increase in time.[29] Further research supports the assertion that more robust antitrust enforcement is correlated with more effective utilization of financial instruments for funding (Dasgupta and Zaldokas, 2019), and an overall increase in productivity (Gutierrez and Philippon, 2023).

Competition has also been shown to have an impact on the effectiveness of macroeconomic policy. Using firm-level data for the United States and a large cross-country firm-level dataset for fourteen advanced economies, Duval et al. (2021) provide evidence that high-markup firms' sales (and fixed assets) respond less to monetary policy shocks than their low-markup counterparts. The underlying reason, according to the authors, is that low-markup firms face borrowing constraints, which amplify their responses to changes in interest rates. Similarly, Akcigit et al. (2021) argue that high-markup firms are less responsive to changes in the costs of inputs, such as changes in interest rates induced by monetary policy: the interest rate can, indeed, be seen as the cost of capital inputs.[30] As a result, a high-markup firm's investment and output will respond only a little to monetary policy changes, weakening the overall economy's response in terms of investment to monetary *stimuli*. This implies that, when competition is weak, it may be harder to successfully control inflation through monetary policy.

Effective competition can also represent a preventive measure against inflation wildfires, thus reducing the need to resort to monetary policy in the first place. Rogoff (2003) argues that increased competition due to trade liberalisation, globalisation and pro-competition structural reforms has contributed to the global decline of inflationary pressures; the author suggests, in particular, that when competition is effective any attempt to raise prices is quickly defeated. Similarly, Chen et al. (2004) find that lower markups induced by trade openness (and thus, arguably, more competition) contributed to a decrease in inflation in eight European countries; they argue that trade openness could account for up to a quarter of the disinflation observed in Europe during the 1990s. More recently, Andrews et al. (2018) confirm that rising globalisation, by increasing the level of competition, contributed to reducing inflation in the previous decades in many advanced economies. The authors focus, in particular, on the implications of global value chain integration[31] and market contestability for inflation. They note, in particular, that the participation in global value chains[32] reduces inflationary pressures by increasing

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[27] More precisely, the authors obtained these estimates comparing the observed outcomes to those estimated in a counterfactual scenario where the DOJ has not intervened. This scenario is estimated Comparing outcomes in states where the DOJ intervened to outcomes of the same industry in other states.

[28] The interventions analysed include decisions concerning anticompetitive mergers, cartels and non-cartel antitrust conduct and agreements. Merger interventions, in particular, include phase II prohibitions, phase II clearances subject to remedies, phase II abandonments and phase I clearances with remedies.

[29] See also European Commission (2021; 2022) for analysis similar to European Commission (2023) with different size of the shocks in market power.

[30] This is driven by the fact that the demand faced by firms that hold market power tends to be less price elastic with respect to a more competitive counterfactual.

[31] The global value chain describes the full range of activities that firms engage in to bring a product from its conception to its end use, and these activities are dispersed across wide geographical spaces.

[32] Global value chains participation is measured as the foreign value-added content of gross exports as a share of gross exports, at the country-industry level.

the ability of firms to substitute domestic inputs with cheaper foreign equivalents.[33] Finally, the authors also find that markups have been increasing, suggesting that market contestability has been declining, globalisation has been stalling and aggregate demand has been strengthening: they suggest that these facts together could lead to inflationary pressures in the medium term, thereby "*letting the inflation genie out of the bottle*".

Finally, there is also empirical literature suggesting that weak competition may reinforce inflation wildfires. Konczal & Lusiani (2022) provide empirical evidence that firms facing less effective competition before the COVID-19 pandemic have been able to take advantage of the demand and supply shifts that are regarded as the main drivers of the recent inflation wave, increasing their margins.[34]

Overall, the literature has established that competition (or lack thereof) matters for aggregate economic outcomes, through a variety of channels. Table 5.7 of chapter 5 summarises the results of the empirical literature discussed in this section.

Box 1.6: The costs of non-competition

Chapter 5 of this study provides new evidence of the magnitude of the damage that weak competition can cause to the economy, following approaches proposed in the economic literature in recent years. Based on the findings obtained in the literature and on own analysis and modelling, the Project Team provides a quantitative assessment of the benefits of competition, in terms of macroeconomic variables such as GDP. This is enabled by a careful estimation of firms' markups, used to proxy for the degree of market power that firms enjoy. The costs of non-competition emerge from comparing the factual scenario with several counterfactuals characterized by a lower average level of markups.

Source: Project Team

To investigate the impact of competition on the economy, both at the micro- and macro-level, the literature discussed in this section adopts various indicators to measure the intensity of competition, ranging from structural characteristics of the market such as the level of concentration and entry barriers or that of regulation, to indicators of firms' behaviour. Section 1.2 explains the rationale for the adoption of these indicators as measures of competition.

1.2 Measuring competition

Competition is a complex and multi-faceted process and can take different shapes depending on the market at hand. Defining competition and measuring its degree are therefore challenging tasks. While there is a wealth of indicators that have been proposed in the literature to measure competition, all are somewhat imperfect. The source of imperfection is also heterogenous: for instance, some indicators focus on certain specific aspects of the competitive process, and disregard others; other measures can lend themselves to somewhat ambiguous interpretation. Each measure

[33] *The authors also investigate the channels through which global value chain participation impacts inflation and note that it does so via downward pressure on unit labour costs – by raising productivity and reducing wages – in the importing country, especially when low-wage countries are integrated in supply chains. Furthermore, they provide evidence supporting the conjecture that a higher level of global value chain integration dampens producer price inflation by accentuating the impact of global economic slack on domestic inflation.*

[34] *More precisely, they find that the pre-pandemics markups are positively associated with an increase in post-pandemic markups.*

of competition will thus have its pros and cons; and the balance between the advantages and limits of each measure of competition will tend to be context specific.

As suggested by OECD (2021), the different measures/indicators of competition can be grouped according to the feature of competition they aim to measure. Based on this taxonomy, competition indicators can be divided into two main groups: structural and performance measures.

Structural measures have the objective of evaluating competition based on the characteristics of market structure. Such measures can be further classified into two sub-categories, namely static and dynamic measures, that differ in their measurement approach. Static structural measures comprise concentration indicators such as the concentration ratio (CR) and the Herfindahl-Hirschman Index (HHI).[35] A coarser concentration indicator is the total number of firms in the market, which does not consider firms' market share.

When concentration indicators are adopted as a measure of competition, one should bear in mind that more concentration in the market does not necessarily imply less competition (Peltzman, 1977), due to the "selection effect" of competition (see section 1.1). Indeed, in some markets higher concentration can be driven by more rivalrous behaviour which lead more efficient firms to gain market shares at the expense of others, which are marginalized or forced to exit the market, leading to an increase in concentration. In other terms, market concentration is both an outcome of past competition, in that the selection mechanism described above entails that high concentration may be an outcome of intense competition; and an important determinant of today's or future degree of competition.

In general, however, everything else being equal, concentrated markets are likely to be characterised by less competition than unconcentrated markets. Indeed, microeconomic theory generally predicts that higher market concentration is associated with higher prices, since it results in a reduction of alternative supply sources. For instance, in a classic industrial organization model of oligopolistic competition such as the Cournot model, where each firm chooses its output so as to maximize its profits given its beliefs about the other firms' choices, as the number of firms increases, the equilibrium price approaches that of a perfectly competitive industry.

Furthermore, greater concentration facilitates collusive outcomes: the economic theory of collusion posits that the latter is easier to achieve and maintain in markets with a low number of firms. In particular, coordination is easier when the number of firms is lower; and the higher the market concentration, the lower the incentives of firms to deviate from a collusive equilibrium.

In addition to the predictions of economic theory, there is also a wealth of empirical economic literature that finds a link between concentration and market outcomes (see chapter 2 for a comprehensive review).

For these reasons, concentration indicators (especially the HHI) are widely used not only in the literature, but also by competition authorities in their competition enforcement

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[35] The CR_n is the sum of the percentage market shares of the largest n firms in the market. The HHI is the sum of the squared market share of each firm competing in a market; it ranges from 0 to 1 (though it is frequently expressed in 10,000 "points", i.e. an HHI equal to 2.5 is expressed as 2,500), with lower values indicating a lower degree of market concentration, and 1 corresponding to a monopoly..

efforts, for instance as an initial screen as to whether a merger may be anticompetitive.[36]

Another aspect to consider is the level at which concentration measures are computed. The rationale behind the use of concentration indicators is that increased concentration implies a reduction of the options available to consumers, which makes them less sensitive to changes in prices. This holds true only if concentration is increased among suppliers of all products/services that are regarded as substitutable by consumers. For this reason, concentration indicators are deemed more meaningful in the context of a relevant market in antitrust terms, which are defined mainly based on an assessment of demand-side substitutability, rather than being calculated at the sectoral level. However, defining relevant markets can be a difficult and time-consuming task (OECD (2012)), requiring to assess patterns of substitutability between products and geographic areas. Further, measuring concentration at the market level can require data that is not readily available (the sales made in the relevant market, which will differ from companies' sale for all firms that are active across multiple markets), so it may not always be feasible. For this reason, country-sector concentration measures are often employed: however, industries and national boundaries may not be an accurate approximation of the actual extension of the relevant market. Measuring concentration at the country-industry level is thus imprecise. Evaluating the evolution of such concentration measures can, however, still provide useful preliminary indication of potential shifts in competition intensity.

Other static structural measures of competition include indicators of the level of entry barriers in markets. The idea is that the greater the hurdle to entry, the less competitive the market will be. Among these measures, the most used are sunk costs, advertisement to sale ratio, R&D expenditure to sales ratio. The idea is that if significant investment is required to operate in a sector (e.g. if a complex infrastructure needs to be built and maintained, if commercialisation of a product is preceded by a long process of research) entry is not easy. Incumbent firms are thus less constrained by the threat of potential competition. Other measures that are used for the same purpose include regulatory indicators such as the Product Market Regulation (PMR) index and the Service Trade Restrictiveness Index (STRI). One limitation of all these indicators is that they seek to measure the conditions for competition, from a structural and/or regulatory perspective, rather than competition itself. An analysis of these conditions can, nevertheless, provide useful complementary evidence to that of concentration: for instance, high concentration is more concerning if entry barriers are high.

All of the indicators discussed thus far are limited by a feature which is common across all of them: the static measurement of a process that is inherently dynamic.

Dynamic structural measures can provide additional insights on the level of competition in a specific market with respect to static ones, because in well-functioning markets firms continuously compete to outdo each other. As explained in section 1.1.1, one of the benefits of effective competition is to favour a reallocation of resources towards more efficient firms. This can also occur as a result of new entrants that, for instance, adopt more efficient technologies, confirming the importance of taking a dynamic perspective.

To assess firm dynamism in markets, the most used measures are entry/exit/churn rates or change in mean firm age. In a similar spirit, indicators that look at the share of economic activity accounted for by young firms, such as startup rates (i.e. the share of

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[36] *For instance, both the EU and US horizontal merger guidelines feature the HHI change, below which it is very unlikely they will identify competitive concerns.*

startup firms among all active firms), have been used: the rationale is that a larger presence of young firms is an indicator that entry has occurred recently. Other indicators such as job-finding rate, job-creation rate, job-destruction rate, job-reallocation rate serve a similar purpose: a competitive market is likely to be associated with higher dynamism in terms of employment (e.g. through the new jobs created by new entrants). Measures of concentration dynamism such as market share stability, rank stability and concentration stability are also often employed. Their main limitation is that markets could be highly competitive without entry/exit rates being particularly high or without changes in market concentration.

To address the limitations of the structural approach, performance measures have also been proposed in the literature. This approach aims at measuring competition by focusing on firms' competitive behaviour. Profit measures such as the Return on Capital Employed (ROCE) or the Return on Sales (ROS) are often used as performance indicators. Profits, however, are often linked to efficiency, which means that high profits do not necessarily imply weak competition and that low profits might be driven by inefficiency and not by a high level of market competition.[37]

A widely used measure of competition intensity falling into the performance category is the markup. This represents the ratio of price to marginal costs, and it is considered to be a measure of market power. Indeed, the lower the intensity of competition in a specific market, the higher the markup that firms can charge on their products. On the contrary, intense competition should drive firms to reduce their markups towards the level where marginal costs equal prices, which is one of the features of perfect competition (see section 1.1). The main advantage of markups is that they are a measure of market power and therefore can provide relevant information on the evolution of competition within and across markets over time.

However, they also have limitations. Markups can increase not only due to weaker competition but also for other reasons and, in particular: (i) due to increases in prices that reflect increases in fixed costs of investments, especially for high-tech firms (De Loecker et al., 2020);[38] (ii) due to increases in prices or decreases in marginal costs that reflect the changing nature of competition, for instance when competition shifts away from prices towards quality and differentiation; and/or (iii) due to decreases in marginal costs that reflect technological changes that allow firms to be more efficient. Not only in these cases markup increases would not reflect a weakening in competition, but they may also be explained by intense competition in the past: it may indeed be the case that, absent competitive pressure, firms would have not engaged in investment, efforts to differentiate their offer or increase product quality or would have not adopted the most efficient technologies. Finally, since markups can be driven up by falling marginal costs, as in a number of media and internet markets, markups can also indicate how efficient firms are: increases in markups in an industry or market can, therefore, also reflect the rising shares of the most efficient firms – i.e. the selection effect of

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[37] Other well-known performance measures are the H-statistic (Rosse and Panzar, 1977) and the Boone indicator. The H-statistic measures the transmission of input prices to firm's revenues, where weak transmission signals market power, and therefore weak competition. The Boone indicator measures the elasticity of profits to marginal costs (i.e., the percentage change in profits due to a 1% change in marginal costs). The more negative the Boone indicator is, the higher the level of competition is in the market. In perfect competition, the elasticity of profit to costs is negative infinite as any increase in costs drives firms to exit the market.

[38] Abraham et al. (2021) show that accounting for the distinction between fixed and variable costs has a sizable impact on the estimation of markups (in their framework, price cost margins). Using data for Belgian firms between 1985 and 2014, they estimate that the largest part of price-cost margins is needed to cover the fixed costs while only a smaller part remains left as excess profits ratio.

competition. From a practical perspective, another limitation of markups is that they are not directly observed, and they have to be estimated econometrically: chapter 5 will review the approaches adopted in the literature for markup estimation and provide its own estimate.

Finally, survey-based indicators have also been used to measure competition. These indicators cannot quantify the degree of competition in the economy. However, consumers' and business' perception of competition in markets can provide very useful insights on the level of differentiation and the perception of consumers in specific sectors: when products are highly differentiated, consumers' perception of their substitutability may be particularly useful. One of the applications of survey-based indicators is the estimation of diversion ratios and closeness of competition indicators which are routinely used in merger control.

Table 1.1 categorizes the various indicators for competition advanced in the literature, and summarizes the advantages and limitations associated with them.

Table 1.1: Advantages and disadvantages of possible competition indicators

Static structural measures			
Indicator		**Advantages**	**Limitations**
Concentration Ratio (CR)	*Relevant market level*	Ease of calculation Under certain assumptions, related to market power	Insufficiently considering market share distribution Assuming higher concentration implies lower competition Complexity of relevant market definition Availability of data at relevant market level
	Industry level	Ease of calculation Data availability Relevant market definition not required	Assuming higher concentration implies lower competition Insufficiently considering market share distribution Industries often do not reflect the boundaries of competition
Herfindahl-Hirschman Index (HHI)	*Relevant market level*	Ease of calculation Under certain assumptions, related to market power	Assuming higher concentration implies lower competition Complexity of relevant market definition Availability of data at relevant market level
	Industry level	Ease of calculation Data availability Relevant market definition not required	Assuming higher concentration implies lower competition Industries often do not reflect the boundaries of competition
Entry Barriers (Sunk costs, Advertisement to sales ratio, R&D expenditure to sale ratio, PMR, STRI)		Providing insights on specific market's/industry's characteristics	Providing a static assessment of dynamic factors Lack of data for specific markets Measuring the conditions for competition, rather than competition itself

Dynamic structural measures		
Indicator	**Advantages**	**Limitations**
Entry/Exit/Survival/job creation rates, average firms' age	Complementing static measures by providing a dynamic assessment of industries'/markets' conditions	Market mechanism might be at work even without entry and/or when there is strong competition between incumbent firms
Market share stability, rank stability and concentration stability	Complementing static measures by providing a dynamic assessment of industries'/markets' conditions	Different dynamic measures can give contradicting results Not informative by themselves – need to be complemented by concentration measures
Performance measures		
Indicator	**Advantages**	**Limitations**
Profits (ROCE / ROS etc..)	Persistent high profits among a limited number of firms can signal weak competition	High (low) profits may result from higher (lower) efficiency, not necessarily from weak (intense) competition Measures derived from accounting data which do not always align with economic principles Accounting principles changer over time/across countries
Panzar-Rosse model (H-Statistic)	Capturing the transmission of input prices to firm's revenues Relevant market definition not required	Complex interpretation of the index Econometric limitations
Boone indicator	Capturing the dynamics for which competition should drive efficient firms to earn more profits than inefficient ones	Focus on efficiencies, disregarding other aspects of competition Econometric limitations (e.g. sensitivity to sample selection and estimation methodologies)
Markup	Providing a direct measure of market power Providing relevant information	Difficult to distinguish the effect of competition from a change in fixed costs

	on the evolution of competition over time	Rises in markups may indicate a shift toward a type of competition centred on quality and differentiation rather than price Increases in markups can reflect the rising shares of the most efficient firms (selection effect)
Others		
Indicator	**Advantages**	**Limitations**
Survey based measures	Complemented with other measures of competition can provide insights on the overall competitive landscape, especially on closeness of competition with differentiated products/services	Depending on perceptions (either consumers' or businesses')

Source: Project Team based on Nielsen et al. (2007) and OECD (2021)

1.3 Trends in the state of competition in the EU

The economic literature provides evidence that advanced economies have experienced a deterioration in certain indicators of competition, and in various measures of economic performance that are related to the state of competition.

1.3.1 Rising concentration

Several studies have investigated the evolution of concentration in advanced economies in the past few decades. The existing studies differ with respect to the geographic areas and time periods covered, the methodology adopted, and in particular the level at which concentration is measured (industry or, in limited cases, relevant antitrust market). Findings are likewise heterogeneous, but certain patterns emerge quite clearly. The economic literature finds the existence of a trend of rising concentration in the US, with limited exceptions; a similar trend is generally observed for the EU, albeit the magnitude of the increase in concentration appears to be lower. The literature on the EU also suggest that a different path of concentration is observed depending on the sector concerned, which would suggest that the trend is not economy-wide.

The publication by the White House Council of Economic Advisors (CEA) of a 2015 paper by Furman and Orszag stimulated an intense debate over whether competition is weakening in the US. The authors analyse the evolution of concentration in 13 broad industrial sectors in the US: they compare the CR_{50} (the share of revenue accounted for by the 50 largest firms) at the national level in 1997 and in 2007 and find an increase in 10 of these sectors since 1997.

Several studies that deliver similar results with different methodologies and data have followed. Autor et al. (2023), building on previous work by Autor et al. (2020), group data from the U.S. Economic Census into six large sectors and build both local and economy-wide HHIs for the period 1992-2017. They compute two alternative HHIs, based on sales and on employment. The economy-wide concentration measures consistently point at a significant increase in concentration in the US.[39] At the local

[39] *The economy-wide HHI raised by 2.3 percentage points using sales data (from 4.4 to 6.7, a 53% increase) and by 1.7 points when considering employment data.*

level,[40] the evidence is instead mixed, since only when concentration is measured based on sales the authors find an increase; the HHI computed based on the number of employees has, instead, fallen on average. The authors attribute these contrasting findings to a structural change in the composition of US economic activity, and in particular to a reallocation of employment from more concentrated (e.g. manufacturing) to less concentrated (e.g. services) industries. Both sales and employment concentration rose within each pair of industry and county, but the between-sector shift in employment was stronger and more than offset the rise in within industry-county employment concentration: the net effect is a decline in local employment concentration.

The economic literature generally indicates that Europe has also experienced a rise in concentration, though of lower magnitude than in the US, and with a relevant degree of heterogeneity across countries and sectors of the economy.

The OECD performed two studies on the evolution of concentration in Europe and both provide evidence of a steady trend of rising concentration since the early 2000s. In one of these studies, Bajgar et al (2019) carry out two different analyses of the trend of concentration in Europe and North America, using two different data sources:

- the first one investigates the evolution of concentration at the country level in 12 European countries,[41] building on firm-level sales from OECD MultiProd,[42] for the period 2001-2012. To measure concentration, the authors examine the evolution of the share of sales captured by the top decile companies in the distribution of sales,[43] and find that it has increased by 2.7 percentage points for manufacturing and by 4.3 percentage points for non-financial services;
- the second one employs data from Orbis-Worldscope-Zephyr to compute concentration indicators at the business group level in two wider world regions (i.e. Europe – treated as a single market – and North America)[44] from 2000 to 2014. The authors exploit the detailed ownership information contained in the data – not available in the OECD MultiProd database – that allows to distinguish firms that are truly independent and those that are part of the same business group. To measure concentration, the authors compute the CR_8 at the business group level based on sales and find a substantial increase in concentration in both macro regions: the index increases on average by 2.2 percentage points in Europe (12% increase) and by 6.8 percentage points in North America (21% increase).[45]

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[40] Local level identified by industry-county cells.

41 The countries and periods covered are as follows: Belgium (2000–2014), Denmark (2000–2012), Finland (2000–2012), France (2000–2014), Germany (2003–2013), Hungary (2000–2012), Ireland (2006–2014), Italy (2001–2014), the Netherlands (2001–2014), Norway (2000–2012), Portugal (2004–2012), and Sweden (2002–2012).

[42] The OECD MultiProd data are collected by OECD through national statistical offices that contain country-firm-level data.

[43] More precisely, the authors use data on firm-level sales from OECD MultiProd and compute country-industry concentration indicators by aggregating the firms' share within each country and 2-digit ISIC code.

[44] The analysis covers, in particular, 19 European countries and two North American countries (U.S. and Canada).

[45] Similar patterns are found for CR_4 and CR_{20}.

In both cases, the authors look at concentration in 2-digit industries and focus on manufacturing[46] and non-financial services sectors.[47]

The authors justify the choice of different concentration measures in the two analyses noting that indicators such as the share of the top 10% firms (or the HHI) are not appropriate when the coverage of firms in the data varies across industries and time, as is the case for the Orbis database. In particular, the sample size of the latter improves over the years with smaller firms being progressively added to the database: this implies that the distribution of sales in the sample also changes for reasons that are not related to actual changes in the distribution of sales in the industry, but only to changes in the coverage of the data. The expanding coverage could, in turn, make firms with relatively lower shares cross the threshold of the top 10%, with the effect of artificially reducing the measure of concentration chosen. The authors note that larger firms are, instead, generally covered since the beginning of the analysis and thus choose to adopt CR_8 as a measure of concentration.

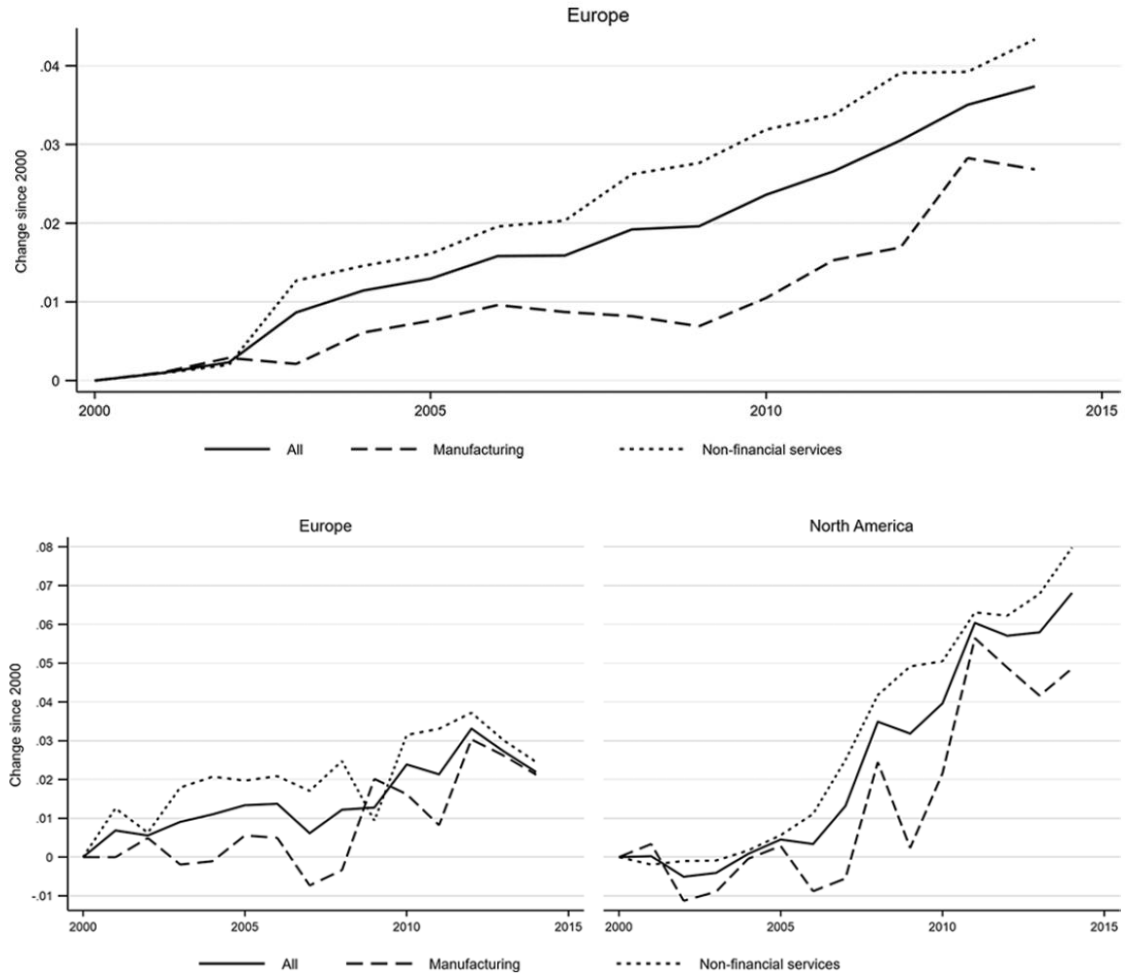
This alone does not address all the potential distortions arising from the limitations of the data: the increasing coverage of the data also implies that summing up the total sales of firms in the data is not appropriate to estimate industry size and compute the shares of each firm, as the industry denominator would tend to increase over time and artificially push down trends in the resulting concentration index. For this reason, the authors obtain industry sales from another data source (the OECD STAN database) and use that as a denominator. On the contrary, the OECD Multiprod database is representative of all firms, which entails that the measure of concentration adopted by the authors when using this source of data is consistent over time.

The main results of both analyses are presented in Figure 1.1, in the top and bottom panel respectively, which shows the cumulative average changes in the concentration indicators described above since 2000, distinguishing between manufacturing and non-financial services.

[46] *Excluding manufacturing of coke and refined petroleum, and real estate.*

[47] *The authors explain that this choice is driven by data availability to perform a cross-country analysis: for confidentiality reasons, indeed, both the OECD MultiProd and STAN database is collected at the 2-digit level.*

Figure 1.1: Evolution of concentration in Europe and North America since 2000



Source: Bajgar et al. (2019) based on OECD MultiProd (top) and on Orbis-Worldscope-Zephyr and OECD-STAN (bottom). Note: in the OECD MultiProd analysis, the plotted average is computed with equal country weights and industry weights given by each industry's share in the total sales across all industries within a given country. In the Orbis/OECD-STAN analysis the plotted average is computed using weights given by each industry's share in the total sales across all industries within a given world region.

In a second, related study, Bajgar et al. (2021) extend the second analysis described above, where Europe was treated as a single market, and document that a similar trend for industry concentration is observed within most European countries in the sample as well as in Japan and the United States.[48] Employing the same data as Bajgar et al. (2019) the authors find an average country-industry rise in concentration of about 5 percentage point, from 37.5% to 42.5%, over the period 2002-2014; when industries are weighted by their sales, concentration rose by 7 percentage point (from 33% to

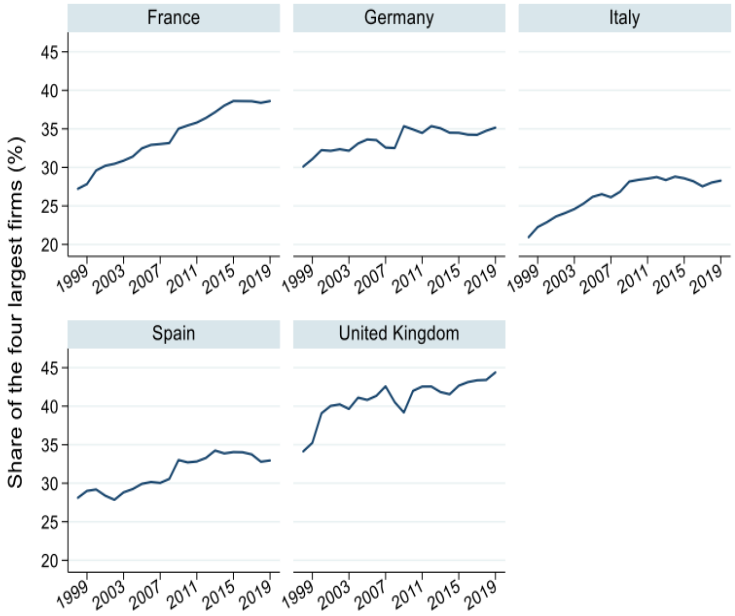
[48] *The sample includes 11 European countries: Belgium, Denmark, Finland, France, Germany, Greece, Italy, Portugal, Spain, Sweden, and the United Kingdom*

40%), suggesting that industries that generate larger value have been interested by a stronger rise in concentration.

Concentration increased in about two-thirds of the country-industry pairs examined, but the magnitude of the rise is heterogeneous across countries and industries. Manufacturing, transportation & storage, and retail are the industries with a more pronounced rise in concentration. Though with different magnitudes, all European countries have experienced a rise in concentration on average, if industries are weighted by their sales – only Germany and Spain have not if an unweighted average across industries is considered.

Koltay et al. (2023) study the evolution of concentration in the five largest European economies (France, Germany, Italy, Spain and the UK) using firm and industry level data from 1998 to 2019.[49] In all five countries, the authors observe an average increase in concentration, as shown in Figure 1.2.[50]

Figure 1.2: Evolution of average CR_4 in France, Germany, Italy, Spain and in the UK, 1998-2019



Source: Koltay et al. (2023) based on Orbis and Euromonitor International's Passport Industrial database[51]

The magnitude of the increase is quite heterogeneous across countries and across industries. In France and the UK, average concentration grew by 10-11 percentage points, in Italy by percentage points, in Germany and Spain by percentage points.

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[49] *Data sources: Euromonitor International and ORBIS database. These data sources provide information on sales at the ISIC 4-digit level.*

[50] *The evolution of industry concentration in the five countries is based on simple (unweighted) averages across industries.*

[51] *In particular, the data on the sales of the four largest firms in each country and industry, used to compute the numerator of the concentration indexes, mainly come from the Orbis dataset; to address the limitations related to the increased coverage of the Orbis database, as reported by Bajgar et al. (2019), industry sizes are instead – the denominators of the concentration indexes – are estimated using consistent data is obtained from the respective national accounts (available from Euromonitor International's Passport Industrial database).*

In terms of broader (ISIC 1-digit) industry sectors, the communication sector is the one with the highest level and largest increase of concentration, with the average CR_4 went from 50% to almost 70%; transport & storage and finance follow. The authors carry out a more in-depth analysis of the manufacturing sector, as it contains 70% of the observed industries, and note that: manufacturing industries with both a high starting level of concentration and an increase in concentration are raw material processing, transport equipment and motor vehicle production as well as the tobacco industry; and that the computer and office equipment industry recorded the largest increase in concentration – CR_4 doubled – although it started from a lower level.

In contrast with the above, a body of literature finds that industry concentration in Europe has not increased.

In particular, Dottling et al. (2017)[52] compare trends of concentration – computing HHIs and CR_4 at sector level based on sales – in the EU and in the US from the late 1990s to the early 2010s and find very different paths, with only the US displaying a clear upward trend. In Europe, instead, they find that concentration has been stable or even decreasing since the early 2000s. However, their results are likely influenced by a bias that affects the measurement of concentration: the coverage of firms in the data source used by the authors[53] changes over time due to frequent missing values, hence the data is not always representative of all firms in the industry. This implies that estimated industry size may change without actual changes to the industry size, but just as a resulting of the changing coverage of the data, and can make the computation of both concentration indexes problematic. To address this issue, the authors compute concentration indexes based on the top 50 firms in a given industry only and argue that this allows to overcome the measurement issue since data availability among larger firms tends to be of higher quality.

The resulting estimated evolution of concentration may, however, still be distorted as the analysis may not be capturing that i) the actual size of the industry is changing, due to entry or exit of firms that are not in the top 50 firms and ii) there could be reallocation of sales from smallest firms to the top 50 firms (a phenomenon that will be discussed in section 1.3.4). The latter would inflate the denominator, possibly contributing to an underestimation of the rise in concentration.

As discussed above, other authors have encountered a similar challenge and decided to rely on alternative data sources, that are representative of all firms in the industry, to estimate the industry size for their analysis of concentration. In particular, Bajgar et al. (2019) show that the choice of denominator has a dramatic effect on the measured industry concentration trends, and that without properly addressing the issue of changing coverage of firms in the data their results would be completely reversed.[54]

Bighelli et al (2023) also find heterogenous patterns for concentration in the EU across countries and sectors. They compute an HHI based on firms' gross output and analyse its evolution between 2009 and 2016, both at the country level and at the EU level.[55]

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[52] The same results are discussed in Gutierrez and Philippon (2018). The issues discussed in the text also affect the approach by Philippon (2019).

[53] Data sources: Compustat for the US, BVD's Orbis and Amadeus for Europe.

[54] In particular, Bajgar et al. (2019) show that their results would be revered using as industry denominators both the total sales of firms in Orbis, and the total sales of the 100 largest firms in Orbis, instead of the OECD-STAN data that they decide to adopt, as explained above.

[55] Data sources: CompNet. The dataset is compiled by the European Central Bank's Competitiveness Research Network, drawing on various administrative and public sources across countries.

They find that i) on average, concentration increased by 43% in Europe, but more than doubled in the manufacturing sector ii) Germany is the greatest contributor to this trend, iii) in 10 out of the 15 countries under analysis the concentration has decreased. Therefore, the overall trend seems to be driven by a few large countries and sectors.[56] Autor et al. (2010) have noted, however, that the data source used by the authors is affected by some limitations that limit cross-country comparability.[57]

Against this background, the CMA (2022) and Monopolkommission (2022) analyse the evolution of industry concentration in their respective reports exploring the state of competition in the UK and Germany. The CMA looks at the evolution of CR_5 and CR_{10} and find that both have, on average,[58] increased significantly in the period analysed (1998-2021), but that they have been following a decreasing trend since 2014. The Monopolkommission examine the evolution of the HHI and CR_6 in 2007-2019 and find that, overall, industry concentration has not risen in Germany. They find, however, different trends for concentration indicators across sectors, and note in particular that sectors that were already highly concentrated, such as telecommunications, postal activities and interurban passenger rail transport, experienced an increase in concentration.

Most of the available literature on concentration, and all the papers discussed thus far, measured at the industry level, mainly due to data availability only at this level of aggregation, especially for cross-country comparisons. In other words, they are using industries to proxy for markets. However, these industries are often much broader than relevant antitrust product market.

In contrast, Affeldt et al. (2021) examine concentration at the level of relevant antitrust markets that were concerned by DG Comp merger decisions in the period 1995-2014. They do so by building a novel database, starting from EC merger decisions, which they leverage for the purpose of defining relevant markets and extracting information about market shares. This approach allows to analyse concentration in areas that are identified based on demand- and supply-side substitutability considerations. They assess the evolution of the HHI in around 20,000 relevant markets, which include national (within the EU), EU-wide and global markets. Their findings suggest that, while concentration has increased on average, the intensity of the trend differs based on i) the sector concerned and ii) the geographic extension of the relevant market. In particular, they find that the services sector is more affected by rising concentration than the manufacturing sectors and that the larger the geographic market definition, the more pronounced the increase in concentration. For instance, while national markets and markets in the manufacturing sector only show a slight increase in concentration (and in some cases, even a decrease), markets in the services sector show a large increase in concentration, especially when they are EU-wide (HHI increasing from 1.000 to 4.000) and worldwide (HHI increasing from below 1.000 to above 5.000).

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[56] The authors aggregate the country-level HHIs to obtain a European HHI weighting countries by their squared output shared and proceed to demonstrate that the outcome is as if a merged panel of European firms was employed. This aggregation method magnifies the contribution of large countries and explains the large contribution of the German economy, as the authors have acknowledged.

[57] In particular, Autor et. al (2020) note that different countries use different reporting thresholds in the definition of their sampling frames. For example, they note that the Belgian data cover all firms, while French data include only firms with high sales. Consequently, the dataset is not equally representative of all firms in the industry across all countries.

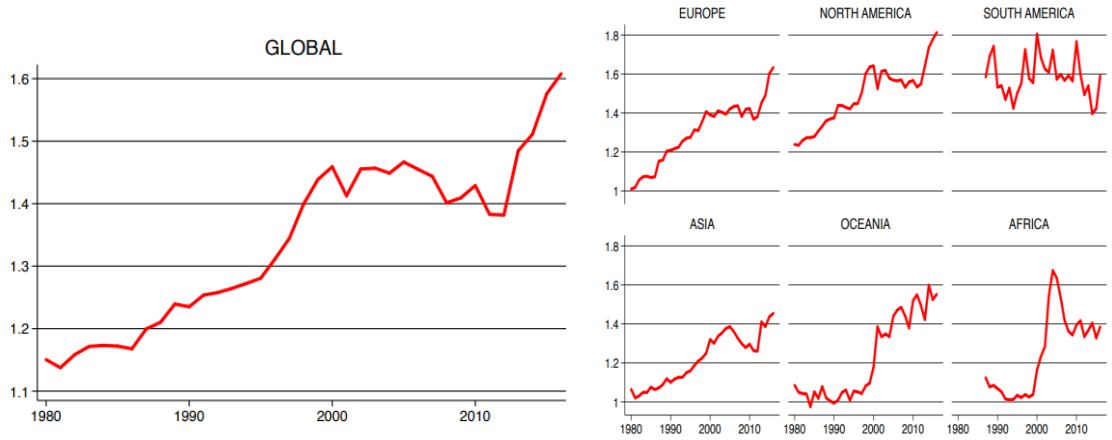
[58] More precisely, the CMA looks at two alternative metrics to obtain a synthetic representation of the HHI across the whole UK economy: a weighted average across sectors, where the weights are represented by the respective value of sales, and the median.

1.3.2 Rising markups

Several recent studies have investigated the evolution of markups, both globally and in the EU, adopting different methodologies and covering different geographic regions and time horizons. These studies consistently point to an average increase in markups in most developed countries, though the magnitude of the phenomenon is variable based on the study. Another common finding of the literature is that the increase in markups seems to be largely driven by already high-markups firms – the ones in the top decile of the markup distribution ("the upper tail"). This would suggest that sector leaders – already likely to hold significant market power – have been able to reinforce their position; and that their position has become harder to challenge for their competitors.

De Loecker and Eeckhout made several contributions to this body of literature. De Loecker and Eeckhout (2018) perform a global analysis of the evolution of markups.[59] Their analysis covers 134 countries and the period from 1980 to 2016: they find that markups have increased, on average, by 39%. Europe, North America and Oceania all display similar increasing patterns (with the only exception of the period 2000-2010, when markups have been quite stable). Figure 1.3 below shows the evolution of markups, globally (left) and for each region (right).

Figure 1.3: Evolution of markups



Source: De Loecker and Eeckhout (2018)

A recent study on corporate market power by Akcigit et al. (2021) investigates the evolution of markups from 1980 to 2016. In their global (82 countries) markups analysis, the overall increase during the time span considered is greater than 30%, butthis has been largely driven by the evolution of markups in more advanced economies. North America and EU both experienced an increase (over 1980-2016) of around 40%, while the Asian (Japan and Korea) countries a lower one (roughly 20%). They also find evidence of entrenchment dynamics: top decile markup distribution firms have more than doubled their markups, while much smaller increases (5%) are found for firms in the bottom-half of the distribution.

Calligaris et al. (2018) confirm that the rise in markups is largely driven by companies already in the top decile of the markup distributions. They analyse data covering 26

[59] *For estimating markups, they use the "Production Approach", originally developed by Hall (1988) for aggregate data and further developed for micro data by De Loecker and Warzynski (2012). The methodologies adopted in the literature to estimate markups will be thoroughly discussed in section 5.1.*

countries across Europe, North America, and Asia in the period 2001-2014. They estimate an average markup increase in range between 4% and 6%.[60] However, the firms in the top decile of the distribution increased their markups by over 20%.

Díez et al. (2021) also analyse the evolution of markups in roughly the same period (2000-2015), covering a sample of 20 countries around the world,[61] and obtain similar results: they find an overall markup increment was 6%; the increment in the markup estimated for firms in the top-decile of the distribution is in this case more prominent (more than 40%).

The CMA (2022) finds that markups have increased by 9.8% in the UK, that most of this increase occurs in the last ten years and that it is significantly more pronounced among the firms that already had high markups (i.e. those in the upper decile of the markup distribution): for these firms, the CMA estimates a rise in markups of 15.2%. To check whether the increase in markups translated into increased profits, or whether it hides that firms are sustaining higher fixed costs, the CMA also looked at the evolution of profitability indicators that capture some of the fixed costs, namely the EBIT margin and the Return on Capital Employed (ROCE), and found that: the economy mean EBIT margins have remained broadly stable, whereas the average ROCE has declined gradually over time, but at a lower pace than that of the decline in the cost of capital, suggesting that some of the increase in markups has resulted in higher net returns to capital holders. The CMA concludes that, overall, the increase in markups and the slower decline of ROCE relative to cost of capital provide tentative evidence that economic profits have increased.

The Monopolkommission (2022) also documents an increase in average markups in Germany, but argues that such increase has been moderate and does not indicate general growth in market power. Specifically, they find that the average markup increased by 1.8% in the manufacturing industry between 2008 and 2017, and even went down by 6% in the services sector. Importantly, they break down the two broad sectors of manufacturing and service into 19 industries and find major differences in the trends of markups across individual industries. For instance, they find that markups have: increased by 21.2% in the manufacture of coke and other refined of petroleum products; increased by 9.2% in the manufacture of computer, electronic and optimal products; increased by 0.6% in transportation and storage (the only industry in the services sectors having experienced a rise in markups); decreased by 7% in the manufacture of pharmaceuticals.

Empirical papers in the field of industrial organization have analysed the evolution of markups and their potential drivers in specific sectors of economic activities in the US. Their findings are briefly summarized below:

- Döpper et al (2023) analyse consumer packaged goods (e.g. ready-to-eat cereal, yogurt, shampoo) in the US and find an increase in market power in the period 2006-2018. They find that marginal costs steadily decline and this accounts for most of the observed markup trend, whereas prices show a mixed trends;
- Collard-Wexler and De Loecker (2015) analyse the steel industry in 1960-2022 and document a decrease in markups;
- Grieco et al (2023) analyse the US automobile industry in the period 1980-2018 and find that prices have increased but so has quality. Overall they find evidence of a

[60] *Results differ based on the production function used for the estimation of markups.*

[61] *Belgium, Bulgaria, Denmark, Estonia, Finland, France, Great Britain, Greece, Hungary, Italy, Japan, Latvia, Netherlands, Poland, Portugal, Romania, Russia, Slovenia, Spain and the United States.*

decrease in markups. Interestingly, they also estimate the evolution of consumer and producer surplus, and find that consumer surplus has increased, despite higher prices;

- Bet (2021) performs an analysis of markups in the US airline industry and find an increasing trend since the 1980s but does not find evidence of higher prices;
- Miller et al (2023) analyse the US cement industry in the period 1974-2015 and find an increase in markups, which is correlated with increased concentration.

These findings, though specific to the US economy, clearly indicate the importance of considering the specificities of each sector. In particular, not only they show that trends in market power differ across specific sectors, but they also suggest that the underlying mechanism driving changes in market power may be significantly different.

1.3.3 Reduced business dynamism

Competition is an inherently dynamic process. As explained in sections 1.1.2 and 1.2, competition stimulates entrepreneurship, thus entry can be considered an indication of effective competition, and in turn it has beneficial effect on economic performance; also, competition stimulates exit by the least efficient firms. An analysis of indicators that capture such dynamism thus provides useful complementary insights on the state of competition to those provided by the indicators discussed above. Looking at dynamic indicators of competition is particularly relevant in light of the rising markups trend discussed above that points at possible entrenchment of market leaders.

The economic literature has investigated the evolution of business dynamism looking at various indicators (introduced in section 1.2) and documents the existence of a general declining trend. The findings also suggest that the US economy is characterised by a higher level of dynamism, but by a more pronounced decreasing trend; and that there is significant heterogeneity in the evolution of business dynamism across European countries.

The ECB econ bulletin (2017) analyse the evolution of business dynamism in EU-14 countries, by computing the rate of business churn, measured by the sum of the birth and death rates of firms.[62] They only find evidence of a slight decrease: the churn rate went from being over 17.5% in 2006 down to slightly above 17% in 2013.

Additional evidence on global business dynamism is provided by Criscuolo et al. (2014). Analysing data from national business registers from 2001 to 2011 covering manufacturing, construction, and non-financial business services for 18 countries worldwide, they investigate the distribution of firms by age and the evolution of firms' age and find that:

- firms that are characterised as old (10 years old or more) are 40% of the total number of firms and account for 60% of total employment;
- there is a downward trend in the start-up rates[63] in several countries. In several European countries (UK, Netherlands, Portugal, Belgium, Sweden and Finland), the downward trend seems to be attributable to the financial crisis: before the crisis, the start-up rates were either steady or increasing; in others (Italy and Austria) the decreasing trend started even before the crisis.

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[62] *The birth (death) rate is the number of firms that entered (exited) the industryas a percentage of the total number of active firms.*

[63] *Defined as the fraction of start-up, i.e. (0-2 year-old firms) among all firms.*

Calvino et al (2020) assess the evolution of dynamism in a worldwide sample of 18 countries comparing the level of entry and exit indicators between 2000 and 2015.[64] They find a pronounced decrease in entry rates in countries such as Turkey, Hungary, and Austria, a mild decrease (lower than five percentage points) in Belgium, Italy, Spain, and no evidence of decline in northern European countries such as Norway and Sweden. The aggregate average entry rate has decreased by more than three percentage points during the time span, while the exit rate has remained mostly flat. The authors also find that the variations observed are mainly due to changes in dynamism within industries rather changes in the share of industries with different levels of dynamism.

De Loecker et al. (2022) study business dynamism in the UK.[65] They find contrasting evidence in terms of business dynamism based on the indicator adopted:

- there is no indication of a decline in the startup rates in the UK, at least since 2000: the entry rate was at 12% in 2000 and 13% in 2019 and it consistently exceeded the death rate (around 10%), thus suggesting that the total number of firms in the UK economy has risen (from 3 and a half million to 6 million);
- the share of economic activity (based on number of employees and turnover) attributable to young firms[66] in the non-financial sector saw a substantial decline between 2000 and 2010, from 14% to 7%. In 2018, this rate was still 10%, while the share in terms of employment had completely recovered.

The authors note that the latter indicator is more meaningful, since the rise in the number of start-up firms was mainly due to the surge of self-employed workers, and "solo self-employed" workers – which employ zero workers other than the owner – in particular. These firms are unlikely to account for a relevant portion of economic activity, as confirmed by the analysis described in the second bullet.

In Cavalleri et al (2019) business dynamism is assessed looking at birth, churn and job-finding rates[67] in the US and in Europe in the period from 1980 to 2015. Overall, the US economy is still characterized by a higher level of dynamism than the EU area in each of the indicators mentioned, but only in the US business dynamism has witnessed a clear decline over time.

Akcigit and Ates (2021, 2023) note several empirical facts suggesting that business dynamism in the US has declined since the 1980s, building on previous literature and notably on Decker et al. (2020). In particular, they find that: entry rate has declined, the employment share of young firms (0-5 years old) has declined and job reallocation (the sum of job creation and destruction rate[68]) has slowed down. The authors discuss these findings and find that this trend has been largely driven by a reduction in knowledge diffusion between frontier and laggard firms. They consider knowledge diffusion a factor that allows followers to catch up with market leaders, and attribute its decline mainly to technological drivers.

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[64] Data from the OECD DynEmp project and national business registers.

[65] Data from UK office for national statistics (ONS) and department of Business, Energy, and Industrial Strategies (BEIS).

[66] Defined by the authors as firms that are less than 5 years old.

[67] The job-finding rate is a measure of the probability that an unemployment individual will find a job. For a detailed mechanism explanation see Shimer (2012), Elsby et al. (2013).

[68] More precisely, job reallocation is defined as the sum of gross jobs created by expanding and entering establishments and gross jobs destroyed by downsizing and exiting establishments, expressed as a rate a share of average two-year employment as in Davis et al. (1996).

The idea that the reduction in business dynamism is attributable to an increasing difficulty in catching up with incumbents is supported by Bessen et al. (2020), who extensively analyse the evolution of business dynamism in the US. In particular, the authors analyse the rate at which industry leaders have been displaced from the 1970s to 2017 and find that it sharply declined since 2000. In particular, they compute two measures of industry disruption: i) the annual displacement rate, i.e. the probability that a firm ranked in the top four by sales in its industry falls out of the top four; and ii) the annual leapfrogging rate, i.e. the probability that a 5-8 ranked firm enters the top four.[69] Both the series raised for decades from the 1970s to the 1990s and exhibit a sharp discontinuity around year 2000.

The authors also investigate the evolution of potential drivers of this trend and find that: the reduction in business dynamism is correlated with an increase in investment in intangibles, and especially software, by incumbent firms, which peaked around 2000; and that higher markups are associated with *greater* dynamism. These findings support the thesis according to which technological change and the related complexity limit disruption, rather than being a disrupting factor.[70]

Bajgar et al. (2021), which have been discussed in section 1.3.1 and will be further discussed in section 1.3.6, also provide empirical evidence of this phenomenon. They investigate how concentration changes are related to three measures of firm mobility at the top[71] and find that rising industry concentration is associated with increasing persistence in the composition of the group of largest firms, in both their relative ranking and their market shares. In addition, the authors present evidence for two channels which might be contributing to this increase in persistence. First, rising concentration appears associated with a greater share of defensive patents by the largest firms and second, in digital-intensive industries, it is linked to more acquisitions by these firms.

1.3.4 Increasing asymmetry and persistence

The economic literature discussed above also suggests that the gap between the leaders of a sector and the other firms operating in it appears to have been widening. Size and markup distributions in many sectors are becoming more skewed, with increasingly large companies dwarfing the others. This may also imply that market structures are becoming increasingly asymmetrical, potentially resulting in greater difficulty in challenging and displacing market leaders.

Rising concentration indicators, discussed in section 1.3.1, suggest that a larger share of economic activity is becoming concentrated in the hands of fewer firms. There are two reasons why concentration can rise: i) the number of competitors can diminish, leaving the relative market positions of the remaining players unchanged, or potentially even increasing the symmetry among the remaining players; ii) there can be a reallocation of market shares from smaller to larger firms, which would make the market structure more asymmetrical; the two mechanisms are not mutually exclusive.

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[69] Data from Compustat database, the National Establishment Time Series (NETS) database produced by Walls & Associates, the Annual Capital Expenditures Survey (ACES) from US Census, and industry level data from the Bureau of Economic Analysis (BEA). The Compustat database only covers publicly listed firms.

[70] Bessen discusses the link between the decreasing rate of displacement of industry leaders and complexity and the use of information technology also in his book "The New Goliath" (2022).

[71] For this purpose, the authors adopt three alternative measures: the share of top 8 firms that were not in the top 8 a year earlier, the correlation of top 8 firm relative ranking with its rank a year earlier and the market share instability measure (capturing the annual variability in firms' market shares).

Therefore, rising concentration alone does not clearly indicate a change in the symmetry of the market structure. If there is evidence that rising concentration is the result of smaller firms losing shares to the benefit of the already larger firms, however, then this trend is also indicative of an increasing asymmetry between the largest firms and the rest. Evidence useful to ascertain whether this reallocation mechanism is (also) playing a role in explaining the observed trend in concentration includes findings that the overall concentration in an industry has a similar evolution to that of concentration ratios that reflect the share of the largest firms: this would indeed mean that the main driver of the concentration trend is the evolution of the shares of the largest firms.

The analysis of concentration in the UK by the CMA (2022), presented in section 1.3.1, provides evidence of this type. The CMA compares the trends of the CR_5 and CR_{10} and notes that the change in concentration is almost entirely driven by the five largest firms in each industry: this is what a comparison of the trends of the CR_5 and CR_{10} suggest, given that the two are nearly identical, with the only difference being the level.

Similar evidence is provided by Bessen (2020): using US data, the author computes CR_4, CR_8, CR_{20} and CR_{50} in terms of industry revenues in the period 1997-2007 and note that the increase in concentration can be attributed to the growing share of the largest firms. The increase in the share of the top 50 firms (1.70%) is not much larger than the increase for the top four (1.43%) or that of the top eight (1.60%).

The literature thus indicates that the rising concentration trend may also be the result of an increase in the asymmetry of market structures.

The evidence on reduced business dynamism (e.g. lower entry and startup rates) may be read in conjunction with the increasing asymmetry trend: the extent to which new entrants may take market shares away from the incumbent firms, making the market structure more symmetrical, seems to be more limited compared to the past. It also suggests that the threat of entry may be less compelling for incumbent firms.

The economic literature suggests that increasing asymmetrical market structures are also accompanied by an increasing asymmetry in markups – i.e. by markup distribution becoming more skewed. Even though the firms at the top of the markup distribution are not necessarily the ones with the largest market shares, this is additional evidence of market power entrenchment. There is quite clear evidence of this phenomenon both on a global scale and in the EU.

In section 1.3.2, several papers that provide evidence of this phenomenon in the EU and in other advanced economies have been discussed: Calligaris et al. (2018), Díez et al. (2021) and Akcigit et al. (2021). The CMA (2022) and Monopolkommission (2022) perform a country-specific analysis of this phenomenon in the UK and Germany respectively and find different results: while the CMA's findings suggest that the estimated increase in markups, described in section 1.3.2, is largely attributable to an increase in markups for firms in the upper tail of the markup distribution, the Monopolkommission finds no evidence of a widening gap between firms with high and low markups.

The work by De Loecker and Eeckhout (2018) that shows that markups have been increasing since the 1980s in most advanced economies, already discussed in section 1.3.2, is among the most influential contributions on this topic. The authors note that the main insight of their analysis is indeed that there has been a change in the

distribution of markups[72] in all the regions of the global economy covered by their analysis: they find that the rise in aggregate markups is driven by the upper tail of the distribution only, with most firms seeing no rise in markups, and a few firms seeing a substantial increase. For the US in particular, De Loecker et al. (2020) find that the median and lower percentiles of the disitribution have not changed while the upper tail has risen substantially.

The authors suggest that another mechanism may be contributing to the entrenchment of the position of industry leaders, that is a reallocation of sales from low to high-markup firms. To assess this phenomenon, the authors analyse the revenue weighted markup distribution and estimate the component that is attributable to reallocation. They find that about half of the increase in global markups is due to the rise in markups themselves (without weighting), and the other half is due to total reallocation; and that this effect is stronger in the US, where reallocation accounts for two-thirds of the rise in markups. This is an indication that high-markup firms are growing in size and is consistent with the hypothesis that they are the most efficient ("selection effect" of competition). The authors note that these findings are linked to the rise of superstar firms, a phenomenon documented by the economic literature (e.g. Autor et al. (2017)) and analysed in chapter 3 of this report.

The bottom line of the literature discussed so far is that the market position of the leaders may be becoming harder to challenge. This implies that they may be facing increasingly less competitive constraints, both actual and potential. In other words, there is a risk that market leaders may behave more independently from competitive pressure, which provides them with scope for exploitation.

1.3.5 Worsening of outcomes: labour share, investment, productivity growth

1.3.5.1 Declining productivity growth

Productivity growth is influenced by a range of factors: innovation, efficiency gains and technological diffusion. Competition can, in turn, have a positive effect on all three. As explained in section 1.1, competition can bring about efficiency gains through its impact on both allocative as well as productive efficiency and can foster innovation and technological diffusion through its impact on dynamic efficiency. Productivity growth can thus be interpreted as another, outcome-based indicator of the state of competition. The EU appears to be experiencing a decline in productivity growth; a phenomenon that does not concern the US according to many comparative studies. Different European countries seem, however, characterized by significantly different paths in productivity growth. Another relevant finding of the economic literature is that the gap in terms of productivity between industry leaders and the laggards has been widening.

While the EU overall has not closed the gap with the so-called productivity frontier (a productivity benchmark represented by the most productive firms in each industry across countries), the magnitude of the decline is significantly different across countries.

Evidence of a slowdown in labour and total factor productivity growth in the Euro area is reported in the ECB economic bulletin (2017), where the growth is measured through various indicators such as output per person employed, output per hours worked and

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[72] More precisely, the authors analyse the unweighted markup distribution, i.e. a distribution where each firm's markups receives equal weight. This is essential to be able to conclude that markups have become, in fact, distributed more unequally. A change in a markup distribution where firms' markups are weighted by their revenues could, instead, be observed only as a result of high-markup firms earning larger revenues, thus weighing more in the distribution – another phenomenon that the authors document in their papers, as explained later in this section.

TFP.[73] All indicators clearly point to a declining tendency. In the years 2008-2016, labour productivity per employed person the euro area grew at an annual rate of around 0.5%, a much slower rate than that observed in the preceding decade (1.1%).[74] Both labour and total factor productivity have been hit significantly by the global financial crisis. Nevertheless, even extending the time horizon, the euro area labour productivity growth has been low: in the first part of the 1990s it was one of the fastest growing regions, but it lost the edge well before the global financial crisis and was among the ones with the slowest growth recently, clearly below the global average and slightly below the advanced economies average. The authors' findings suggest that the slowdown in productivity growth was not due to a shift in industrial structure towards lower labour productivity sectors, but rather to a decline in within-sector productivity.

Andrews et al (2015, 2016) analyse the productivity trend and document a slowdown in the aggregate productivity, measured via labour productivity and total factor productivity, in a group of OECD countries over multiple years starting from 1997.[75] They also investigate how the trend differs between global frontier – which includes the most efficient firms form different countries – the others (laggards). Their findings suggest that productivity growth at the frontier has remained stable and the gap between frontier firms and the laggards has increased: in terms of TFP, the former are 4 to 5 times more productive than the laggards.[76] This evidence is consistent with that of increasing asymmetry discussed in section 1.3.4 above.

Berlingieri et al. (2017) report increasing asymmetry in productivity using a global sample of 16 countries[77]. To illustrate the trends in productivity performance of top performers (firms at the top of the firms' productivity distribution) vis-à-vis the laggards, the authors compute the difference between the 90th and the 10th percentile of the productivity distribution over time (from 2001 to 2012)[78]. The within-country sector dispersion increased over time on average across all countries, with a cumulative increase of around 12% during the span (the pattern is similar for all the productivity measures). The evidence suggests a contribution to productivity divergence both from an acceleration of frontier firms and from a productivity slowdown of firms with below-median productivity, although the latter impacted more over the period.

Gopinath et al. (2017) provide evidence suggesting the evolution of productivity growth has been heterogeneous across European countries. Using firm-level data,[79] they study the evolution of productivity growth in France, Germany, Italy, Norway, Portugal and Spain and find a significant decline in the TFP for Spain, Italy, and Portugal[80] while there is no evidence for a downward trend in Germany, France and Norway, suggesting a marked difference between southern and northern Europe.

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[73] Data sources: Eurostat and EC AMECO database

[74] The figures reported are three-years moving average.

[75] They use data from Orbis Database (BVD) and OECD database.

[76] The difference is even larger, and in the scale of 10 times, when looking at labour productivity only.

[77] Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Hungary, Italy, Japan, Luxembourg, Netherlands, Norway, New Zealand, and Sweden.

[78] Data source: OECD MultiProd project database. Manufacturing and (non-financial) services sectors. Productivity measured via labour productivity (value added per worker) and MFP (Multi-Factor Productivity). Macro sector level obtained by country as averages across 2-digits sectors weighted by employment (labour productivity) and value added (MFP).

[79] Data source: Orbis-Amadeus database

[80] Portugal data are only available post-2006

For the UK specifically, the slowdown in the aggregate labour productivity growth is documented by De Loecker et al. (2022) using data from multiple datasets[81]. Since 1980 until the 2008-financial crisis, the average productivity growth (real GDP per hour) was about 2.4% per year, while post 2009 the trend is almost flat. In terms of productivity dispersion, it is evident the growing gap between the leaders and the laggards: the top 5% firms (in terms of productivity), the leaders, experienced a cumulate productivity growth of 67% from 1996 to 2016. On the other hand, the laggards (the firm not in the top 5 centiles), cumulatively increased only by 14% over the same span.

Fernald and Inklaar (2020) analyse TFP trends in the EU-15[82] and identify several patterns: (i) on average, the decline of TFP growth started in the 1960s and intensified in the 1990s, (ii) since the 1990s southern European countries have been losing considerable ground relative to the US while for northern European countries the divergence is less severe, (iii) no European country has reached the productivity frontier. In figures, EU-15 yearly TFP growth has fallen steadily over time: it was around 0.95% in the decade 1985-1995, 0.47% in 1995-2007, and -0.12% between 2007 and 2017. This increasing disparity between the two ends of the distribution can be explained by the increasing productivity gap between the top firms and the rest that in turn is due to the spread of proprietary IT. Large firms invest disproportionately more in proprietary software (as they can bear the risk, rely on economies of scale, and receive greater benefits from these type of investment), and this increase their productivity relative to the other firms as proprietary IT is associated with higher labour productivity and larger revenue across all the industries. The author shows that the relationship between IT and productivity is stronger for the top 4 four firms compared to the remaining ones.

1.3.5.2 Declining investment

There is extensive evidence that business investment has been weak in the past decades in most advanced economies and has, in particular, experienced a sharp contraction starting from the financial crisis. As discussed in section 1.1, the degree of investment can be affected by market power. Firms that gain market power have less incentive to invest in innovation due to the absence of competitive pressure. Investment can be a key competitive variable, especially in some sectors; declining investment can thus also be interpreted as a sign of lower competitive pressure. The weakness in investment may simply reflect weak fundamentals, such as slow output growth, which was weak when the economy was recovering from the financial crisis. While there is evidence that this is not the whole story in the US, where the phenomenon has been found to be structural and dates back to at least the early 2000s, in Europe the observed slump in investment seems to be largely driven by the economic cycle. What emerges clearly from the literature is that the composition of investment has changed in all advanced economies: firms are moving away from investments in physical capital, with investment in equipment and tangible assets being increasingly replaced by investment in intangible capital (e.g. software, IPPs and brands among others). It should be noted that the increasing role of intangibles is regarded by the economic literature as one of the drivers of the rise of superstar firms (see section 3.1.2.1)

The phenomenon of declining investment has been analysed by the International Monetary Fund (IMF, 2015), that discusses findings from other papers and performs own analysis. It documents weak fixed investment globally and shows that business

[81] *Data sources: UK Office for National Statistics (ONS), Business Structure Database (BSD), Annual Business Survey (ABS), Orbis (from BVD).*

[82] *Using data from Penn World Table (PWT).*

fixed investment,[83] as opposed to residential investment, is responsible for most of the investment slump since the financial crisis.[84] Weak economic activity seems to be the main driver: this is suggested by IMF's empirical analysis as well as by surveys, where businesses often cite low demand as the dominant factor. Other factors at play are financial constraints and policy uncertainty, as confirmed by the fact that firms in sectors that rely more on external funds, such as pharmaceuticals, have seen a larger fall in investment than other firms since the crisis; and that firms whose stock prices typically respond more to measures of aggregate uncertainty have cut back more on investment in the years analysed, even after the role of weak sales is accounted for.

Baldi et al. (2014) analyse the evolution of (both residential and non-residential) investment in Europe, US and Japan in the period 1999-2013 and find that the gross capital investment was stable for the first decade, even increasing in some countries due to the push of construction investments,[85] and then decreased after to the financial crisis.[86] The authors compare actual investment to an optimal level of investment that could be predicted based on the prevailing economic conditions, which they estimate through an econometric model. Their findings suggest that, overall, in the EU-18 area the actual investment rate was, on average, approximately 0.5 percentage points lower than the rate derived in the model in the period from 1999 to 2012, but this was driven by under-investment in the period 2010-2012; they find, instead, evidence of over-investment in the US.[87] They also find that investment in individual European countries has been highly heterogeneous, and that investment in Germany, Netherlands and Finland was lower than the optimal level even before the financial downturn. However, their analysis only includes a few years after the crisis.

Dottling et al. (2017) analyse the evolution of fixed investment in the non-financial business sector across European economies and in the US between 1995 and 2015, distinguishing between tangible and intangible investment. They find that investment in Europe remained relatively stable from 1995 until the financial crisis, at which point it drops substantially. The share of investment in equipment had started to decrease before, in the early 2000s, offset by an increase in investment in intangible assets. The authors argue that, differently than the US, where the phenomenon is structural,[88] in Europe the reasons behind the observed trend of investment are cyclical. In particular, they find that in Europe investment has been roughly in line with measures of profitability for the majority of the countries analysed, except at the peak of the crisis, most notably Spain and Italy.

The literature covering the US only confirm that the slump in business investment has started before the financial crisis and that there has been a shift from investment in physical capital to investment in intangibles. Crouzet and Eberly (2019) find evidence of a gap between actual investment and the investment that would be expected based

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[83] Fixed investment contrasts with investments in labour, ongoing operating expenses, materials or financial assets.

[84] Though the slump in residential investment was sharper.

[85] The push of construction investment especially affected southern Europe.

[86] Data source: European Commission.

[87] The authors attribute their findings for the US, which also contrast with other available evidence in the literature, to statistical revisions in the US in July 2013 that would have been implemented later and that entail that expenditures for research and development and military weapons systems are classified as investments, differently than in the EU.

[88] The same argument is proposed by Gutiérrez and Philippon (2016, 2017), who show in particular that investment in the US was weak relative to profits.

on economic fundamentals.[89] Their results suggest that this is attributable to a drop in investment rates in physical capital (and in particular in property, plant, and equipment) that started in the early 2000s; and that, in parallel, a shift toward more investment in intangible capital, including patents, brands and business processes, has been observed. In particular, the share of total firm capital represented by intangible capital rose from slightly above 15% in 1995 to above 40% in 2015. Importantly, the rise in investment in intangible capital is concentrated among industry leaders.[90]

1.3.5.3 Decreasing labour share

The labour share is the share of net national income going to labour (i.e. the share that is paid out in wages). There is extensive evidence that the labour share in the EU has been decreasing since the 1980s, as it has done in the US. The existing literature suggests that this trend has been more pronounced for the manufacturing and construction sector; and that low and middle-skilled workers have been affected more than high-skilled workers. This decline can be interpreted as a sign of malfunctioning competition, at least in some sectors of the economy: lower levels of competition intensity may have allowed firms to gain market power and set high prices relative to costs. These higher margins have not been equally shared between capital and labour, with a greater proportion of the rents being captured by capital compared to labour. This interpretation is in line with the findings of the literature discussed in section 1.1.2, which suggests that one channel through which competition can impact macroeconomic performance is indeed by influencing the labour share of GDP.

Dimova (2019) analyses the evolution of the labour share in 28 EU countries from 2002 to 2014 and find an overall decreasing trend. Notably, this paper shows that the evolution of the labour share differs significantly across skill categories and sectors:

- on average, the labour share accruing to low and middle-skilled workers in the EU declined by 1.7 and 1.9 percentage points respectively, whereas for high-skilled workers the authors find a 2 percentage points increase;
- goods producing industries have witnessed a decline in labour share across all EU countries; the sectors affected the most were manufacturing and construction. Service sectors instead experienced a rise in labour share, albeit to varying degrees, in many of the EU economies analysed;
- the changes in labour share stem from within-industry transformation rather than between-industry changes: in other words, the observed change in the labour share is not driven by a change in the industrial composition that entails the reallocation of factors towards capital intensive industries, and is instead attributable to the fact that workers within an industry have been gaining a lower share of income.

Karabarbounis and Neiman (2013) find a global decrease of corporate labour share of 5 percentage points – from a starting point of 64% in the 1970s to 59% in 2012 – and they confirm that most of the observed decline shall be attributed to within-industry changes. Their sector-level analysis covers 59 countries[91] and focuses on the corporate

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[89] Source: Compustat database.

[90] Alexander and Eberly (2017) analyse investment in the US by listed and non-financial firms from the 1970s to 2015 and find very similar patterns. They note that the role of intellectual property investment – which capture a substantial part investment in intangibles – has been consistently increasing in the period covered by their analysis: intellectual property investments represented 10% of the total gross private domestic investment in 1970 and roughly 25% in 2015.

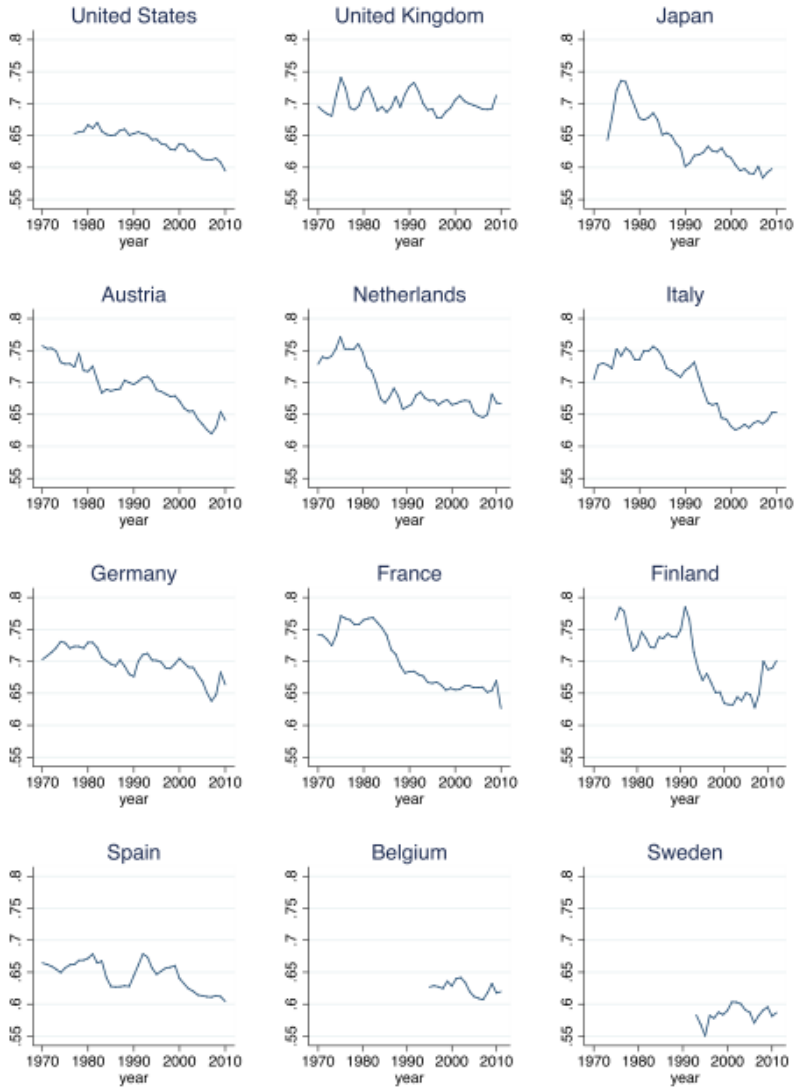
[91] They combine country-specific data and sector-level data from multiple sources.

sector:[92] in 46 cases, they find a statistically significant country-level trend; 37 of them are negative. This study suggests that the decline in labour shares is a global phenomenon: the US, China, Japan and Germany all experienced a negative trend, and in the top-8 world-wide economies only the UK did not experience any downturn. To analyse differences across industries, Karabarbounis and Neiman split the economy into 10 major sectors. They find that that 8 trends are statistically significant, out of which 6 were negative: mining, transport, manufacturing, utilities, wholesale & retail, and public services; the sectors characterized by a positive trend were agriculture and finance & business services.

Autor et al. (2017) also perform an analysis of the evolution of labour share and find that most advanced economies, except the UK, have experienced a decline. Their analysis covers four decades, from 1970 to 2010, and the main findings are reported in Figure 1.4. The authors link this phenomenon to that of rising concentration: their findings suggest that industries with larger increases in product market concentration have experienced larger declines in the labour share; and that the fall in the labour share is largely due to the reallocation of sales and value added between firms rather than a general fall in the labour share for the average firm.

[92] *Referring to the categories of economic activity typically adopted in System of National Accounts standards, this implies that the authors' analysis excludes the household and government sectors (thus unincorporated businesses, sole proprietors, non-profits serving households, and the actual and imputed rental income accruing to noncorporate owners of housing, which are included in the household sector). The corporate sector considered by the authors includes both financial and non-financial corporations.*

Figure 1.4: The evolution of labour share in 12 OECD countries, 1970-2010



Source: Autor at al. (2017) based on data from EU KLEMS July 2012 release

The literature, however, also suggests that the evolution of labour share may critically depend on the way such share is measured.

The labour share provides a measure of the allocation of business output between workers and owners. Two major empirical challenges affect the measurement of labour shares: the treatment of mixed income (i.e. self-employment) and the role of housing; the former affects the numerator of the labour share, the latter affects the denominator. The inclusion of housing income may be particularly distortive for the assessment of the evolution of labour shares: Rognlie (2015) shows that the rise in housing value added explains a large portion of the decline in total economy labour shares.

It is to address these empirical challenges that the literature (including Karabarbounis and Neiman (2013)) typically focuses on the labour shares of the corporate sectors, as it is assumed that self-employed workers and housing assets are excluded from the sector.

Gutierrez and Piton (2020) challenge this assumption and argue that these measurement issues have biased previous estimates, as the corporate sector actually

includes figures on housing and self-employment.[93] They also note that these figures play a non-negligible role: in fact, 15% of fixed assets in the EU corporate sector are dwellings (reaching 30% for France), and self-employed workers contribute as much as 15% of total hours worked in the corporate sector (e.g., in Italy). To address these measurement issues, they build two alternative corrected measures of labour shares series from 1970, using industry-level data. With this different methodology, they obtain results that contradict most of the available evidence: they find no evidence of a global phenomenon of decreasing labour share, as this share declined in US,[94] Canada and Japan, but raised in the UK and remained on average flat (and in the range 65-70%) in the EU-28. Nevertheless, it should be noted that the observed trends experienced several changes in the time span analysed by the authors: in most advanced economies except the US, the labour share was increasing during the 1970s, falling in the 1980s and back to the initial level in the 1990s; it then slightly declined until the financial crisis and recovered afterwards. Analysing the evolution of the labour share at broad sector level, they find that the manufacturing labour share contributes the most to the observed decline in the US, where the business service labour share has instead been stable. in Europe, they find no significant difference between the two. The authors acknowledge, however, that these aggregates may obscure substantial heterogeneity within and across countries, noting in particular that the manufacturing labour share fell in some European economies and rose in others.

More recently, Bellocchi et al. (2023) analyse the evolution of the labour share in 20 EU countries and 19 NACE (level 1) industries from 2011 to 2019. Their results are more in line with the prevailing view that there has been a decline in the labour share. They employ firm-level data[95] arguing that this approach allows them to overcome the measurement issues described above. They estimate that the labour share fell from an average of around 63% in 1995 to roughly 61% in 2019 for the 4 EU biggest economies (France, Germany, Italy and Spain) and from 64-65% to 62% for the EU-28 as a whole. From 1995 to 2019, most of the variation (around 70%) in labour share trends across countries is related to within-sector variation, in agreement with other studies. In the same time span, the largest contractions in labour share are observed in the constructions and high-tech manufacturing sectors. In a more restricted sample (from 2011 to 2019 with 20 EU countries), the authors observe a decline in the labour share in 11 of the 19 EU industries considered.

1.3.6 Conclusions

The economic literature has widely documented that certain indicators of economic performance have been worsening: the labour share of income, business investment and productivity growth have all been decreasing. Whilst there are many determinants of these outcomes, they are to some extent determined also by the level of competition. The economic literature indeed provides evidence that competition can impact the economy through various channels, including by influencing the above outcomes.

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[93] In particular, they note that as per the System of National Accounts guidelines that are followed by most countries in the EU, the corporate sector includes "all units engaged in market production that act independently of their owners". This includes legally constituted corporations, in addition to cooperatives, limited liability partnerships, notional resident units, and quasi corporations, which often own and operate housing and include self-employed workers.

[94] As already mentioned in section 1.1.2, one of the authors in a previous work (Gutierrez (2017)) attributed the trend of declining concentration in the US to weakening competition, and to rising concentration in particular.

[95] From Amadeus Database (Bureau Van Dijk)

The extent to which competition contributes to determining these outcomes is unknown, but there is evidence that competition has been weakening, and that therefore this may be a contributing factor towards the outcomes that are observed. The economic literature discussed in the sections above has indeed documented a deterioration in several indicators of competition:

- concentration at sector level seems to have increased;
- markups have increased, especially for the firms at the top of the markup distribution;
- business dynamism has decreased; and
- market structures may have become more asymmetric, in terms of size and market power.

Though none of the above indicators is perfect, taken all together they indicate that competition may have been weakening.

The findings of the literature, however, do not imply that these indicators of competition have worsened in every region and sector of economic activity. On the contrary, one key message of the literature is that there is a significant degree of country and sector heterogeneity in most of the trends discussed, and that looking at broad aggregates, both in product and in geographic terms, may hide this heterogenous behaviour.

Some academic contributions have sought to shed light on the likely drivers of these trends – especially those concerning rising markups and rising concentration – by linking them to the evolution of prices. Evidence that rising markups are not correlated with price changes suggests firms have managed to achieve cost reductions; similarly, in the absence increased efficiencies, one would expect that increased concentration would have led to price increases. Overall, these contributions suggest that a key driver of rising markups and rising concentration is the role of secular market forces and, in particular, of technological changes.

As noted in section 1.2, technological changes made possible by sunk investments allowing firms to reduce their marginal costs can contribute to markup increases. The same mechanism could result in more concentrated market structures, as only the largest firms may have the resources to sustain the investments called for by technological changes, thus becoming more efficient and gaining market shares at the expenses of smaller firms; taking a more dynamic perspective, such investments will also raise barriers to entry, contributing to keeping markets at this higher level of concentration.

As discussed in section 1.3.1, Bajgar et al. (2021) contribute to the literature suggesting that concentration has been increasing, with an empirical analysis covering 11 European countries, the US and Japan, from 2002 to 2014. The authors also find that rising investment in intangibles has played a large role in explaining rising concentration, and that this effect is magnified by openness to trade and digital intensity: they motivate this finding through scalability of intangibles, which imply that they are particularly conducive to growth of the largest firms in digital-intensive industries and in more open economies.[96] Interestingly, the authors also find little evidence for alternative explanations that have been proposed in the literature, such as weak antitrust

[96] *For example, the authors note that an invention or software can be applied in many different markets at low (and sometimes near zero) marginal costs; and that this gives an inherent advantage to the largest global firms, which have the cash needed to invest heavily in intangibles (that can be difficult to finance) and the scale needed to recoup the sunk costs.*

enforcement of mergers and acquisitions: their results suggest that concentration increases do not appear to be directly associated with large mergers and acquisitions.[97]

To investigate whether the observed increase in concentration reflects a worsening competitive environment, the authors also explore how rising concentration is related to other proxy measures of the intensity of competition, including markups and prices. They find that concentration changes are positively correlated with changes in the markups of the largest firms; but that industry level prices increase less in country-industries with stronger concentration increases.[98] The authors conclude that these results, taken together, are consistent with models where large business groups incur the fixed costs of investing in intangible assets and are rewarded by reduced marginal costs (De Ridder, 2019). Indeed, the authors' results suggest that, in the country-industries where concentration increased, prices declined but marginal costs decline even more. In another words, the cost reductions were only partially passed through to customers, which in turn is consistent with the existence of market power.[99].

Ganapati (2021) performs a similar analysis, covering the US and the period 1972-2012, and finds that concentration increases are uncorrelated with price changes.[100] He comments that his results suggest that rising oligopolies are likely due to technical innovation or scale economies. This explanation is also supported by his analyses, which suggest that increases in market concentration are strongly correlated with productivity innovation. The author notes that his results are consistent with the literature documenting higher markups, as these could indicate large fixed costs that reduce marginal production costs.[101]

Similarly, Miller & Conlon (2023) investigate the relationship between markups and prices in the US in the period 1980-2018. They match the firm-level markup changes found by De Loecker, Eeckhout and Unger (2020) to industry price changes,[102] and examine whether firms that exhibit greater markup growth are in industries that exhibit greater price increases. They find no evidence of such correlation, and conclude that their findings do not support a hypothesis that the increase in markups is solely driven

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[97] Furthermore, the authors' findings suggest that globalization did not play a direct role in explaining the observed increase in concentration – and it only magnifies the effect of intangibles; and that there is only weak evidence they are associated with product market deregulation.

[98] More precisely, the authors regress 4-year changes in the average markup of the 8 largest groups in each country and industry on the 4-year changes in industry concentration and find that a 10-percentage-point increase in concentration corresponds to 1.3% higher markups of the largest firms; they also regress 4-year growth in industry price indices on the 4-year changes in industry concentration and find a strong negative correlation, implying that a 10-percentage-point increase in concentration corresponds to a 2.3% reduction in industry prices. To measure prices, the authors rely on industry price indices at the level of A64 industries from the OECD STAN database.

[99] It is well established in economic theory that the more competitive a market is the higher the pass-through of changes in marginal costs will be. At the extreme, in a perfect competition setting, firms have no market power, and their prices will equal marginal costs; a change in marginal cost will thus be fully reflected in prices. The relationship becomes looser once we depart from a perfect competition setting, with imperfect pass-though of changes in marginal costs.

[100] Similarly to Bajgar et al. (2021), the author regresses the five-year difference in industry price on the five-year difference in industry concentration. He notes that, in the absence of straightforward exogenous shifters of market concentration, these regressions are presented as correlational and lack causality. The price data used by the author are primarily sourced from the Bureau of Labor Statistics (BLS) Producer Price Indices (PPI).

[101] The author also suggests that his results should be interpreted through the perspective of Sutton-style models, where fixed costs are used to reduce marginal costs (Sutton 1991).

[102] In particular, to the price changes that arise in the firms' industry codes, obtained from the Bureau of Labor Statistics (BLS).

by weakened competitive pressure that enabled a transfer of surplus from consumers to firms through higher prices,[103] and that an alternative, or additional, mechanism has been at play: markup increases reflect changing production technologies that lowered marginal costs (and possibly raise fixed costs), paired with an imperfect pass-through of marginal costs to prices.

To sum up, the economic literature suggests that technological change and the increasing role of intangibles significantly contributed to the rising concentration and rising markups observed in many advanced economies. The bottom line is that the shape of competition has been somewhat changing: to be an effective competitor, firms need to invest more, raising fixed costs; this translates into higher barriers to entry, contributing to more concentrated markets which, in turn, may result in higher markups on marginal costs that are not competed away.

This should not be taken as an indication that the trends described in the previous sections are not reason for concern. Indeed, the fact that markups have been rising more quickly than prices implies that cost savings are not being fully passed on to consumers: this is consistent with less competitive markets, as suggested by increased concentration across several industries. An imperfect pass-through of cost-savings to prices is *per se* an indicator that firms have market power. Finally, large global firms are inherently advantaged, as they have the scale to recoup such fixed investments, which may contribute to entrenchment of market leaders, as the empirical evidence suggests.

This explanation is also consistent with the finding of the literature that there is a relevant degree of heterogeneity in the evolution of competition indicators across industries, as not all sectors of economic activity are equally affected by the same forces.

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[103] The authors acknowledge that their analysis is subject to certain caveats and a "false negative", i.e. a positive correlation existing between markup and price changes, may still exist. In particular, the markup estimates they obtain are limited to publicly traded firms, whereas the price indices of the BLS are intended to reflect the contributions of all domestic producers; and price indices are not available for all industry codes listed by Compustat.

2 Price-concentration studies

The EU's pursuit of a common market for goods has a long history, arguably starting in 1957 with the Treaty of Rome, if not even before.[104] To support the objective of achieving a single market, the EC has implemented and enforced many disciplines, notably via EU primary legislation and EC regulations, directives and interpretative documents that together have created an apparatus to prevent anti-competitive mergers, disallow unjustified State Aid, stop and prevent abuses of market dominance and economic cartels. With the exception of State Aid, these disciplines have further been enforced at the Member State level. Most sectors within the EU have ultimately ended up being covered by these disciplines.

Curiously, despite the passage of more than half a century since establishing an objective of a common market, one feature of the EU markets remains difficult to explain: ongoing differences in prices between Member States. This economic mystery is not limited to a single product. Rather, differences exist for many products and across a number of sectors.[105] While not all products feature such differences[106], a better understanding about the origins of the differences that exist can inform policy. Given that formal and informal trade barriers between states have largely been eliminated, for example, we would not expect price differences to arise from a lack of possibility of trade. We here seek to add to the information that might explain the origins of these price differences. To ground the analysis in detail, we will focus on emblematic and varied sectors, namely mobile telecom and airlines (for which substantial data analysis is performed), as well as beer, mortgages, modern consumer retail and cement (for which a more descriptive assessment is provided).

Factors that could explain price differences include cost differences, differences in demand, regulatory variation and – most importantly for the present study – structural factors such as differences in (local) market structure and market power. Cost differences could persist due to transport, raw materials, energy and underlying endowments of Member States. Regulations may create different cost and entry obligations for businesses. Finally, despite vigorous enforcement against anti-competitive activities by businesses, market power differentials can persist for a variety of reasons, such as buying habits of consumers and their preferences, minimum efficient scale and other factors.

Understanding the origins of these price differences, and the role that competition may play in generating them, matters. With respect to mobile telecom pricing, if the EU Member States with three mobile network operators had four, annual customer savings of 197 million euros could be achieved. With respect to airlines, our research suggests that airline fares may fall by 3% or more when adding one competitor on a route within the EU, or the equivalent of 898 million euros in customer savings on an annual basis. Similarly, to give a sense of the potential scale of gains that could arise if the conditions in the lowest price countries in our samples could be replicated in the ones with the highest prices, in the four more descriptive sector studies (focusing less on detailed data

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104 https://eur-lex.europa.eu/EN/legal-content/summary/treaty-of-rome-eec.html, *https://www.europarl.europa.eu/factsheets/en/sheet/33/the-internal-market-general-principles.*

105 *For examples from auto and music, see Goldberg, P. and Verboven, F. (2005), Lee, I. (2010), Verboven, F., 1996, Waldfogel, J., 2020. For a more general view across many industries, see Herz, B. and Mejer, M. (2021).*

106 *Mail or internet ordered products available across states at a common price can provide an example of price convergence.*

analysis), we find that annual gains from achieving the best price observed among our sample would be about 1.12b euros for Belgian beer buyers, 4.4b euros for mortgage holders in the Netherlands, 21.8b euros for grocery purchasers in Germany, and 770m euros for cement buyers in France. These figures are purely indicative and subject to specific methodological caveats, such as that our confidence level in the data and empirical assessment varies across sectors. Nonetheless, these figures can provide a sense of the potential impacts if weak competition were the source of the observed price differences; and they illustrate the possible consequences of a further weakening of competition (e.g. due to further consolidation).

The approach we will take for enhancing our understanding of price differences will build around sector *stories* that are paradigmatic of the way that market concentration can influence key outcomes for customers, including price, investment and quality of product/services. We will focus on sectors chosen, after reasoned analysis of many possibilities, to represent a variety of economic activities, across different core environments, and for which price and concentration data would both be available and would exhibit variation, along with having cost or regulatory data available. We do not suggest these sectors are representative of all sectors. For each of these sectors, we will find that while costs and regulations may differ across countries, these differences do not seem to fully explain price differences. We will therefore seek to understand the extent to which market power, approximated by market concentration, might be related to higher prices.

We will consider the way market concentration has contributed to shaping certain market outcomes. However, when it comes to empirical exercises seeking to establish a causal link, it is key to ensure that the variation in market structure that we observe and exploit to estimate a relationship with price has been caused by an exogenous shock. In practice, this means analyzing markets where entry/exit decisions are not driven by market forces; or exploiting events that have altered market structure while being independent of underlying market forces. Such approaches help to address the issue explained in section 2.1 below, i.e., that market outcomes (e.g., price) and market concentration are both the result of underlying demand and supply conditions, making it harder to establish a causal relationship between the two. For example, the level of costs may influence both the price and the decision to enter/exit a market, and thus market structure. Not accounting for this would lead to biased estimates of the "true" impact of concentration on price.

To some extent, a comparison between Europe and the US can also be useful for illustrating the international tendencies of market power and margins over time. In such a comparison, Philippon (2019) notes that, compared to the US, the EU lies in the range of relatively good performers in terms of changes in concentration by sector and in terms of outcomes like pricing or margins. While market power is itself difficult to measure, concentration is more amenable to measurement, as are prices (see section 1.2). Philippon and Gutierrez (2018) as well as Philippon (2019) find that for many industries the EU has experienced lesser increases in concentration and also suggests that prices may be more moderated in the EU than the US as a result. Although these authors' analyses has been subject to criticism,[107] using different data and methodology, Bajgar et al (2019) have also found that the EU changes in concentration were smaller than those in the US over the post-2000 period (see section 1.3.1). Thus, the literature overall suggests that the EU has experienced less pronounced increases in

[107] *In particular, the denominator used by the authors to compute market shares, hence concentration indexes, has been argued as inappropriate, e.g. by Bajgar et al. (2019) and Koltay et al. (2023); see section 1.3.1 for a more detailed discussion.*

concentration. Consistently, the markup increases documented in the literature are found to be lower in the EU than in the US.

Much like Philippon (2019), we focus on particular sectoral examples to illustrate these points. We first focus on two particularly prominent sectors: airlines and mobile telecom. In the case of airlines, we examine developments in the US and, for a shorter period of time, in the EU. The data suggest that the US did experience a particular jump in airline concentration between 2010 and 2013 following large mergers. While airline mergers have occurred in the EU as well, they were much smaller than in the US and low-cost carriers play a particularly prominent role. These overall patterns are reflected in lower HHI levels in the aggregate in the EU. In the case of mobile telecoms, as highlighted by Philippon (2019), US mobile phone plans have historically maintained high price levels compared to EU countries. For whatever reason, high prices in the US have existed for decades as we observe in our data. In an international comparison, we also examine those factors that influence investment in mobile networks and find that competition among mobile network operators (MNOs) is associated with both lower consumer prices and more investment, while mobile virtual network operators (MVNOs) appear to play some role in motivating country-wide investment (though less than 1%) but not average price differences .

At a more descriptive level, we consider four further sectors that were selected in order to illustrate different types of economic activity and their experiences with competition: business-to-consumer sectors, such as beer, mortgages and modern consumer retail (basically supermarkets), as well as a business-to-business sector – cement. These sector studies include discussions of literature and cases, as well as some basic descriptive examinations of concentration and prices for different Member States. For each of these, a number of countries have been chosen to enable an examination of factors that could impact costs, prices and business strategies. In making the country selection, an effort was made to ensure geographic breadth and pricing differentials. In the case of groceries, we also consider the US modern consumer retail as a source of comparison.

The ultimate objective of this chapter's analysis is to examine the potential link between market concentration and market outcomes across Member States for various sectors of economic activity. As discussed in section 1.2, market (or sector) concentration is routinely used to proxy the level of competition prevailing in a certain market (or sector); and concentrated industries are typically hypothesised as a contributing factor to higher pricing, given the same underlying cost structure. We can measure concentration with variables built up from market presence indicators, such as the HHI.[108] As explained in section 1.2, this hypothesis arises from commonly studied models of monopoly, oligopoly under quantity competition, and competition between atomistic price-taking firms, all of which illustrate that a lower degree of concentration is associated with a lower level of prices. The sector experiences explored here end up suggesting the benefits of competition at the level of sectors/markets. This finding should not be surprising, given the ample theoretical evidence in the economic literature suggesting that market structure is broadly related to market power, as well as the increasing body of rigorous empirical work that suggests the same result.

Providing firms with market power and unilateral incentives to increase prices is not the only reason why market concentration can affect outcomes. Higher market

[108] *As explained in section 1.2, the HHI is the Hirschman-Herfindahl Index and it is measured as the sum of squared market shares, varying between 0 (very unconcentrated) and 10,000 (maximally concentrated, i.e., monopoly.)*

concentration can also increase firms' ability and/or incentives to engage in illicit behaviour such as collusion and exercise of (individual or collective) dominance to foreclose rivals, with a subsequent further increase in market power. In competition law enforcement, these are often considered as further risks related to increases in concentration. The PCAs discussed and performed in this chapter, however, do not allow to attribute an observed price change to any of the possible underlying reasons; and they do not allow to measure the increased risk of coordinated effects or abuse of collective dominance arising from increased concentration.

The evidence used varies across the sectors to be analysed. For all the sectors examined, we conduct thorough desk research to understand their evolution across the analysed countries, with the objective of understanding how competition works in those sectors (i.e., the identification of the main competitive variables) and of key features of differentiation. For three major products/services, namely airlines, mobile pricing and mobile investment, we conduct original empirical work based on a rigorous methodology that allows to address a fundamental risk that concerns PCAs and affected many of the early studies in the economics literature on industrial organisation, known as the endogeneity bias. Endogeneity can arise, among other reasons, when the dependent and explanatory variable are simultaneously determined:[109] ignoring or unproperly addressing this issue leads to biased estimates. PCAs are generally characterised by this concern, as they seek to establish a relationship between prices and market structure, which are both determined, *inter alia*, by common underlying market forces. The studies we conduct address this concern, exploiting variation in market structure that has a plausibly independent (or more technically, 'exogenous') source from price.

The purpose is to provide an order of magnitude of the impacts that more competition can bring about, based on a cross-country benchmarking, i.e., to examine what would happen if market structure were to change. For four further sectors, we perform a higher-level sectoral review, relying on a mix of previous studies that have analysed the sector and descriptive data analysis, without necessarily asserting causal relationships that would require more careful empirical exercises (as described in section 2.5 to 2.8).

2.1 Literature review

2.1.1 The relevance and value of price-concentration studies – why are they helpful?

There are good reasons why simple profit or price-concentration analyses (PCAs) were one of the first applications of economic methods to competition policy (or antitrust).[110] Despite the challenges involved in undertaking these studies, by improving upon the profit-concentration studies of previous eras, they offered the prospect of an insight into the value of competition policy; a way to identify what was at stake for consumers, and

[109] *More precisely, in econometrics endogeneity refers to a situation in which an explanatory variable is correlated with the error term. Other than simultaneity, endogeneity can arise if an unobserved or omitted variable is confounding both independent and dependent variables, or when independent variables are measured with error.*

[110] *We define Price Concentration Analyses (PCAs) to include analyses that look at the relationship between price and concentration, whether that concentration is measured by the number of competitors or HHI (or another metric) and whether the relationship is estimated by simple regression or using instrumental variables and/or exogenous shocks. We recognise this covers a wide variety of analyses, some of which have a strong basis in economic theory, while some do not. See section 2.1.2 and 2.1.3 for the strengths and weaknesses of price-concentration analyses, and for a discussion of which types represent best practice.*

hence a means to understand how important it was for policymakers to both design legislation and fund agencies to protect competition.

Since those initial applications, the challenges of undertaking reliable studies that control for endogeneity have been well articulated by many economists.[111] However, the need to answer the same questions has remained, and has, if anything, grown, as evidence in recent years has pointed towards significant increases in markups, reduced churn in firms, and more concentrated industries. These trends, which may warrant a move towards a stricter competition policy's enforcement position that attaches greater weight to the risk of harm to consumers, have led to renewed interest in understanding how to quantify those risks.

At the same time the introduction of the Digital Markets Act[112] and other pro-competitive regulatory regimes around the world have sought to use pro-competitive regulatory interventions such as portability and interoperability standards to reduce barriers. The objective to permit new entry or expansion of small providers is hoped to de-concentrate markets and improve outcomes for consumers through lower prices, heightened quality, and greater innovation. The basis for such changes rests on an understanding that entry and lower concentration will improve outcomes.

The view that lower concentration helps to improve outcomes is built into the use by some PCAs of formal calculations of concentration (e.g., HHIs) within merger analysis. But not all PCAs use calculations of concentration. PCAs that do not use one of the common measures of concentration, like HHI, to measure market structure can also provide useful insight both as evidence within merger and market investigations, and as information to help calibrate merger thresholds that are used for presumptions that can be used to trigger burden-shifting steps in the assessment of a merger.[113] For instance, such studies have been cited in support of retaining and strengthening the structural presumptions set out in Philadelphia Bank.[114]

2.1.2 Strengths of price-concentration studies

It is the intensity of competition among firms that drives markets to deliver outcomes that consumers want such as product availability, better prices and higher or lower quality.[115] Competition policy therefore focuses on protecting and incentivising effective competition. Competition agencies have different tools that they can use in seeking to protect and incentivise effective competition.

One tool – merger control – directly focuses on market structure and ex-ante protecting against changes in that structure that can remove the scope for competitive interactions

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[111] *Newmark (2004), Schmalensee (1989) and Froeb and Werden (1991).*

[112] *EU Digital Markets Act (2022).*

[113] *See for example Nocke and Whinston (2022).*

[114] *See United States v. Philadelphia National Bank, 374 U.S. 321, 362 (1963), in which the Court found that "[A] merger which produces a firm controlling an undue percentage share of the relevant market, and results in a significant increase in the concentration of firms in that market, is so inherently likely to lessen competition substantially that it must be enjoined in the absence of evidence clearly showing that the merger is not likely to have such anticompetitive effects." The case for strengthening or retaining this presumption is for example discussed in Hovenkamp and Shapiro, (2018), Salop (2015), Baker (2002) and Baker and Salop. (2001).*

[115] *O'Brien (2017).*

between previously independent firms.[116] However, preserving the scope for competitive interactions does not preserve or guarantee the intensity of those interactions. Agencies therefore also focus on tools that increase the incentives for firms to conduct themselves in a competitive fashion. For instance, increasing the likelihood of firms being caught when they behave anti-competitively, and imposing heavy sanctions when firms are caught behaving anti-competitively.

These tools operate as complements to one another; preventing concentration preserves a scope for competitive interaction between a variety of firms, while incentives to behave competitively ensure that this scope for competition is turned into actual competitive constraints. Equally, preventing concentration incentivises competitive conduct, since it is harder to act anticompetitively in a less concentrated market. However, it is difficult to measure the likelihood of anticompetitive practices being detected, or the impact of heavier punishments. The effectiveness with which these tools are wielded is therefore typically assessed by reference to their exercise within specific cases, via ex-post review.

In comparison, as discussed in section 1.2, relatively well-established techniques for measuring concentration exist, once the appropriate extent of the relevant market is defined. Defining the relevant market is a complex exercise that includes looking at a variety of factors, such as the product and market definitions, the degree of substitutability among products, as well as barriers to entry and expansion.[117] Nonetheless, once defined, market concentration is a variable that a competition authority can be more effective in intervening to change. This is evident in the cross-agency preference for structural remedies to well-identified competition problems, rather than difficult to monitor behavioural commitments.

The ability to measure concentration also makes it feasible to examine the relationship between market structure and outcomes, both in specific cases (ex-post-merger review), and outside the context of a merger. Understanding such a relationship, if done well, potentially allows for a better calibration and optimization of the risks that agencies take in their decision-making on market structure interventions (be they merger decisions, divestments, or break-up remedies). For example, it helps inform policymakers' views on the right balance of risk between an under or overly interventionist approach to merger assessment.[118]

As discussed above, one of the most significant challenges in conducting a best practice version of these analyses is to address the potential endogeneity issue. Despite this and further challenges (discussed in section 2.1.3 below), a properly conducted PCA is a step forward on the types of cross-industry profit-concentration (as measured through the HHI) studies that preceded them.

Firstly, the concept of the PCA accords very well with basic economic intuition that in most markets the degree of market concentration (e.g. the number of firms in the market) matters for price. Under some behavioural assumptions (e.g. in a simple

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[116] We note that another example of such a tool are market investigations that are able to break-up concentrated markets, such as the UK Competition Commission's Airports Investigation (2009). Abuse of Dominance investigations also preserve the scope for competition by preventing the foreclosure of rivals, however their focus is identifying and discouraging conduct that reduces the intensity of competition. In this sense these contribute to both preserving the scope for competition and incentivizing more intense competition.

[117] See Paulo Burnier da Silveira, Relevant market, Global Dictionary of Competition Law, Concurrences, Art. N° 12297.

[118] For a useful reference on type I and type II errors, see Affeldt et al. (2021).

Cournot or differentiated Bertrand model), indeed, there is a well-defined causal relationship between a change in the number of firms and price.[119] In particular, a smaller number of firms in the market creates a greater incentive for the remaining firms to increase price or restrict output. By focusing on this relationship, PCAs can thus provide useful insight on the actual presence and magnitude of the causal effect of concentration – as measured by the number of firms – on market outcomes. However, , for the estimated relationship to be correct ("unbiased") it is paramount to make sure that the observed change in the market structure is not itself in part caused by the prices that prevail within that market. Otherwise, the estimated relationship between market concentration and price will in fact reflect a mix of causes and effects, but not a clean causal effect. Notwithstanding, after accounting for endogeneity issues, several empirical studies confirmed that higher concentration leads to higher prices in a variety of sectors (Lopez et. al., 2002; Leith and Malley, 2007). For example, Hovhannisyan et. al. (2019) shows that a five percent increase in retail food market concentration would lead to a 18% increase in prices.

In practice, this can mean that changes in the number of competitors that are in a reasonable sense independent of market conditions can be used to measure market structure and to estimate the causal effect that this has on prices or other outcomes. For example, this may involve looking at the impact of a merger driven by considerations in other markets, or an entry/exit event caused by exogenous factors such as regulatory changes. Alternatively, it might involve looking at the pass-on of common cost shocks in differently structured markets.[120]

We refer to these types of analysis as best practice PCAs. However, it is important not to make the best the enemy of the good. As such, we do not dismiss the insight provided by analyses that have sought to address these issues albeit imperfectly. These can help inform expectations and a 'default' presumption in the absence of evidence to the contrary. For example, some PCAs acknowledge the risk of bias, but identify the direction of such bias in order to identify their estimate as a bound that may nevertheless provide useful insight.[121] While generalising about the direction of bias is difficult due to different situations, it does appear that some studies find the bias is towards under-estimation of effects of competition on prices.

Secondly, analyses focusing on the impact of concentration on price instead of profit have the advantage of removing concerns over the measurement of profits. Accounting profits are not the same as economic profits, and accounting standards and rules change over time. This makes defining economic profits and accurately tracking their movement over time extremely challenging.

Thirdly, a lack of profitability will also generally be observed when firms are inefficient, and hence will be common in markets overloaded with inefficient firms, perhaps due to a lack of competitive intensity. Profits will also often vary according to cyclical macro-economic factors that affect demand, and the extent to which sunk costs need to be recovered through high 'profits' within a different timeline.

Finally, an important strength of a price concentration analysis is that prices, as opposed to profits, can more easily be measured at a product rather than firm level. PCAs can therefore look at the relationship between prices and concentration at the product level,

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[119] See pp 258 and footnote 26 in Miller et al. (2022).

[120] See, for example, the analysis of impacts of a tax change in Greek islands by Genakos and Pagliero (2022).

[121] See UK Competition Commission (2008) Grocery Inquiry: Final Report Appendix 4.4.

and particularly within relevant antitrust markets, that seek to define the boundaries of competition between firms.[122]

2.1.3 Weaknesses of price-concentration studies

As alluded to above, PCAs may have a number of weaknesses, and while addressing these can strengthen the studies, a failure to do so can weaken and in some cases completely undermine the study.

First, some PCAs estimate a causal relationship but without properly addressing the endogeneity concerns set out in the introduction of this chapter.[123] For example, an apparent impact of concentration on prices or profits may simply reflect the greater efficiency of the firms that win and thereby highly concentrate their markets. Some consider this to be less problematic for price studies since, for example, efficient firms that come to dominate their market as a result of competing on the merits would reduce prices. This means there would not be the same risk of confusion as to what is causing higher prices.[124] However, we note that this differs when the more efficient firm is a firm with a smaller market share. In those cases, their efficiency can reduce concentration *and* prices, and recreate the interrelationship problems that affect profit-concentration analyses. Notwithstanding, it is important to highlight that, when these interrelationships are properly accounted for, it seems that the negative impact of concentration on prices is higher (Hovhannisyan et. al., 2019; Zhu et. al., 2009). This suggests that not accounting for them understates the relationship between concentration and prices. Indeed, some studies have shown that higher concentration can enable higher markups after a merger (Stiebale and Szuecs, 2022) as well as higher prices (Allain et. al., 2017).

There is also a concern that high prices (or profits) cause entry. If this is the case, as seems likely, then accurately estimating the effect that entry (that is itself caused by high prices – so called reverse causality) has on prices becomes difficult. The effects are entangled and identifying correlation between them tells us little about what is driving what.

A second potential weakness of PCAs is related to the first one: some studies overlook the possibility that smaller markets have higher costs, and these may drive up both concentration and prices. When this is the case, the underlying reason for such cost differences must be properly taken into account for conducting a PCA, which otherwise risks leading to misleading conclusions.[125] One of the reasons that can justify higher concentration and prices in smaller markets is the presence of economies of scale: in sectors with this feature, firms will need to achieve a certain scale to be able to be able to reduce prices; it may even be unfeasible to envisage further profitable entry. For example, consider a small market in which the current equilibrium price allows incumbents to earn economic profits. It might be the case that entry would reduce expected margins due to an increase in average costs such that the new equilibrium prices do not allow to cover the costs of productions: entry would be discouraged in the

[122] *Relevant antitrust markets are defined using the best practice framework provided by the hypothetical monopolist test (that is by reference to demand and supply side substitutability).*

[123] *Berry, Gaynor & Scott Morton (2019).*

[124] *Shaffer (1994) pp7.*

[125] *Newmark (1990).*

first place. This implies that it can be the case that small markets might therefore remain concentrated and show high prices.[126]

With similar market conditions, a PCA that compares outcomes in markets with different sizes may conclude that prices in the more concentrated markets are higher due to higher market concentration, when in fact both concentration and prices can be the result of higher costs. In this case, the PCA would be merely estimating a correlation, not a causal effect. Notwithstanding, PCAs can still be conducted in these sectors as long as key differences between the markets examined like the ones described above are adjusted for.

Thirdly, some PCAs seek to estimate a causal relationship where there is none. In particular, they focus on identifying a causal relationship between price and HHI.[127] HHI measures the degree of market shares dispersion among the firms operating in a market. When measured in relation to a well-defined relevant market, the HHI gives a useful measure of concentration. It is therefore sometimes used to define thresholds for merger notification or for a presumption. However, while it provides a more informative description of the market structure than a simple count of firms within the market, this insight arises from the use of market shares (usually based on revenues or sales) to build the index.[128] This can be a problem because it is not market share that influences the price that a firm sets, but market power, which is driven by substitutability, the lodestar of any competitive assessment.[129] Notable examples are the risk of consumers substituting to purchase from other firms, and the risk of firms switching capacity into the market. There is therefore no relationship between market share and price to be estimated. Instead, all that can be estimated is the correlation between the two outcomes of a set of competitive interactions between firms that can be intense or weak.

This means that adjustments to the methodology to address the endogeneity concerns are not sufficient to accurately measure the impact of market structure on price. Instead, the measure of market structure should be uncontaminated by measures of success within that market.

Fourthly, market structure itself, by its very nature, whether measured purely by number of participants, or augmented with information on the success of those participants through HHI, does not measure the closeness of competition. It says very little about product or geographic differentiation because for products to be considered part of the same relevant market it is sufficient for substitutability to be strong enough, thus not accounting for the different degrees of substitutability that one may observe across different product pairs within the same relevant market.[130]

Further, as explained in chapter 1, competition is about *conduct*: the same market structure can in theory be consistent with both a lack of competition and the presence of effective competition.[131] An unconcentrated market can for example conceal explicit collusion by those within the market. One concentrated market might feature an abuse of a dominant position to exclude current or potential rivals, while another does not.

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[126] *See Lambson (1987) and Demsetz (1989).*

[127] *O'Brien (2017).*

[128] *For instance, a 10 firm market might involve 1 firm with 91% of the market and 9 firms with 1%, or 10 firms with 10% of the market. The HHI communicates this difference while a firm count does not.*

[129] *See OECD (2022).*

[130] *Kaplow (2010).*

[131] *Shapiro (2018).*

Similarly, one concentrated market may occur against a backdrop of multi-market contact, whilst another may not, and this can radically increase the risks of coordination in markets that from a structural perspective might appear to be identical. Nonetheless, some studies claim that higher concentration tends to facilitate coordination amongst companies and lead to higher profits (Levenstein and Suslow, 2006).

Taken together this means that market structure is not sufficient to describe competition intensity. Nevertheless, as recognised in section 2.1, there is a complementarity between efforts to prevent concentration and efforts to guard against anticompetitive conduct. As a result, well-executed PCAs can be informative on the (magnitude of the) impact that market structure can have (on the presumption that all else is equal), even if they do not (and do not claim to) show the whole picture.

Finally, PCAs will inevitably provide less insight in markets where price is not an important dimension of competition, for instance in luxury goods markets. As will be seen in chapter 4, product quality is often an important dimension of competition. In such cases, PCAs may not be able to provide insights on the impact of market concentration on market outcomes: they may even suggest that increased competition – as suggested by lower concentration – is associated with an increase in prices, hence with a worsening of outcomes, when a closer examination might reveal that this is the result of more intense quality competition.[132] For this reason, many of the sectors that we plan to examine in more detail focus on products that are largely homogenous in nature. We would expect competition in such markets to focus on prices rather than quality.

In conclusion, market structure is not the same as competitive intensity, but it is an important part of the story of a well-functioning market, and PCAs that carefully measure its effects are therefore valuable. 'Careful analysis' in this context means that using price instead of profits is not enough, nor is using the number of rivals instead of the HHI; instead, these need to be combined with a methodology that estimates causation while avoiding the interrelationship amongst the different variables. As set out above this is possible, but not without considerable challenges.

In this context, this study seeks to present a number of original research pieces that offer a best practice approach to PCAs (sections 2.2-2.4), while reviewing what we already know, along with basic data, from a range of other PCAs (sections 2.5-2.8), some but not all of which conform to best practice, and from simpler descriptive analysis and anecdotal evidence that characterises and adds context to the relationship that is examined.

2.1.4 Overview of the main findings from price-concentration studies

In this section we briefly summarise some of the studies mentioned above to illustrate the scale of results regarding the relationship between concentration and market outcomes.

The first set of studies deal with the food and consumer retail sector:

- Lopez et. al. (2002) develop a new empirical industrial organisation (NEIO) model incorporating measures of industrial concentration and separating the oligopoly-power from the cost-efficiency effects of concentration on output prices. This model is then applied to 4-digit SIC data on 32 U.S. food manufacturing industries over the 1972-1992 period. The authors conclude that concentration would significantly increase oligopoly power, result in cost efficiency in one-third of the industries, and

[132] *Newmark (2004).*

increase output price in nearly every case. In particular, a 1% increase in HHI can lead to a price increase between 1%-6%;

- using disaggregated information on product barcode, store and retail real estate data for the US food industry, Hovhannisyan et. al. (2019) apply instrumental variables (IV) econometric techniques to study the relationship between retail food prices and market structure. In particular, the authors used a reduced-form framework where retail prices were expressed as a function of HHI (the measure of concentration) and market-specific descriptors such as population and income. They conclude that a 5% increase in concentration would increase prices by 18% and decrease food consumption by 2–5%;
- within the same industry, Allain et. al. (2017) analyse the impact of a merger in the French supermarket industry on food prices. Combining a dataset on the French retail sector (with information on location, ownership, and characteristics of the stores) and another on consumer food purchases and prices at the stores, the authors apply a counterfactual approach to estimate how prices would have changed absent the merger. They take advantage of the fact that, before the merger, the merging parties were not operating in all local markets, implying that the merger did not have a direct impact on local competition in all markets. Hence, the effect of the merger was estimated by comparing price changes in local markets affected by the merger to price changes in local markets unaffected by the merger. The authors show a significant post-merger price increase between 1.8% and 2.4% at the stores of rivals of the merging parties located in areas affected by the merger. Additionally, the merger is correlated with a 4% to 5% increase in merging firms' prices;
- though most of the empirical literature on the relationship between market structure and market outcomes focuses on prices, there is also some empirical evidence of the effect of changes in market structure on other, non-price market outcomes. For instance, Matsa (2010) analyses the US supermarket industry and investigates the impact of increased competition induced by the entry of the transnational company Wal-Mart in certain local areas. The author finds that entry stimulates investment in inventory and staff assigned to shelf monitoring by competing stores, which in turn has a positive effect on product availability, a relevant parameter of the competition among supermarkets. The author acknowledges that Wal-Mart entry decisions are dependent on the expected profitability of entry; and that this is likely to bias cross-sectional estimates, because market characteristics that affect Wal-Mart's entry decision are also. They argue, instead, that panel OLS regressions with market fixed effects provide the most reliable estimates of the effects of Wal-Mart's entry, as long as, conditional on entry, the exact timing is uncorrelated with other determinants of incumbents' inventory policies. In support of this assumption, I find no pre-existing trends in the stockout rates of incumbent stores before they experience Wal-Mart entry.[133]

The impact of mergers on market outcomes, particularly on prices, has also been analysed in other sectors:

- for the home appliance sector in the US, Ashenfelter (2013) applies a difference-in-difference approach to study the impact on prices of Whirlpool's acquisition of Maytag. Using data covering a period before and after the acquisition, they estimated how markets for different types of appliances were impacted. In particular, to test whether the merger raised priced, they conduct comparisons within appliance categories

[133] *In support of this assumption, the author shows that there are no pre-existing trends in the stockout rates of incumbent stores before they experience Wal-Mart entry.*

between products produced by Maytag or Whirlpool and rival appliance manufactures. The authors conclude that prices rose between 3% and 4% for a variety of products after the merger;

- for beer, Ashenfelter et al. (2015) analyses the 2008 merger between the second and third largest firms in the US beer industry. Using brand-level microdata to account for differences in the composition of beers sold across markets, they perform a before-and-after approach to analyse whether prices have changed after the merger. The authors conclude that the increase in concentration (average increase of 358 HHI points) led to a price increase of 2%. Nonetheless, this increase was offset by a nearly equal (1.8%) and opposite efficiency effect;
- Dafny et. al. (2012) studies the effect of changes in concentration on premiums in the health insurance industry. They estimate the relationship between health insurance premiums and provider concentration by using the predicted increase in concentration resulting from a large merger in 1999 of two health insurance providers as an instrumental variable. In other words, to account for the possible endogeneity issues between premium growth and concentration levels, they exploit the heterogeneous increases in local market concentration generated by the merger. While both companies were represented nationwide, the pre-merger market shares of the two firms varied significantly across specific geographic markets. This results in very different shocks to post-merger concentration. They concluded that the merger was associated with a premium increase of approximately 7 percentage points;
- for banks, Allen et. al. (2013) applies a difference-in-difference approach to study the impact on prices among consumers directly affected by a merger in the Canadian mortgage industry. On average, the loss of a competitor led to an increase in the average interest rate in treated markets of approximately 6 basis points (bps). However, once the distribution of loan sizes is taken into account, the loss of a competitor increased interest rates between 7 and 9 bps for consumers in the lower and middle percentiles of the distribution, and had no effect on consumers in the top 30 percent;
- for education, Russell (2021) applies a difference-in-difference methodology to study the impact of 72 mergers between non-profit colleges and universities in the U.S. between 2000 and 2005. The author concludes that, on average, mergers involving public or private non-profit institutions raised tuition fees by 5% for full-time students and 7% for part-time students;
- for telecoms, Genakos et al. (2018) analyse the wave of consolidation in the mobile telecommunications industry of selected OECD countries during the period 2002-2014. The authors adopted a panel data approach with fixed effects for countries and time periods, and instrumental variables for remaining endogeneity regarding the market structure variable. They conclude that, on average, a 10-percentage point increase in the HHI leads to a price increase of 20%;
- for petrol, Houde (2012) applies an empirical model of spatial competition to evaluate the consequences of a vertical merger. While vertical mergers may not be as obvious an indicator of structural changes in market power as horizontal ones, the authors argue that, within the gasoline market, vertically-integrated retailers usually have significant market power, the authors aim to understand the impact of the merger on retail prices. Using data between 1991 and 2001 for every gasoline station in Quebec City, they estimate models using both difference-in-difference and counterfactual simulation methods, and conclude that prices increased between 0.15 and 0.45 cents per litre, which corresponds to 4–11% increases in average retail margins;
- Stiebale and Szuecs (2022) analyse the effects of 194 mergers on the markups of non-merging rival firms across a broad set of industries. The authors combine information on mergers and acquisitions (M&A) with accounting data from the Orbis

database to estimate production functions based on variables such as sales, material expenditures, number of employees, and capital stock. From these estimated parameters it is possible to estimate markups at the firm-level (see chapter 5 for a description of how to estimate firm-level markups). These markups can in turn be combined with other market variables to analyse the pre- and post- merger performance of rival firms. Concentration is not explicitly studied, though is assumed present following mergers of rivals. Since the mergers did not occur randomly, the authors take a step further and applied a propensity score matching technique to build a control group of firms with similar characteristics that have not been affected by mergers. Finally, they compare changes in outcome variables between rivals and the control group using a difference-in-difference estimator. The conclusion is that M&A can increase the markups of rival firms between 2% and 4%. If costs remain constant, this finding also implies a positive price increase from the examined M&A.

As a summary of the findings arising from the literature review, Table 2.1 lists the scale of results for the relationship between concentration and market outcomes.

Table 2.1: Summary of literature review

Paper	*Area*	*Results*
Allain et. al. (2017)	Retail food	Prices increased between 4% and 5% after a merger.
Allen et. al. (2013)	Banks	The loss of a competitor led to an increase in the average interest rate of 6 basis points.
Ashenfelter (2013)	Home appliances	Prices increased between 3% and 4% after merger.
Ashenfelter et al. (2015)	Beer	The increase in concentration (average increase of 358 HHI points) led to a price increase of 2%, which was offset by efficiencies (1.8%)
Dafny et. al. (2012)	Health insurance	The merger was associated with a premium increase of approximately 7 percentage points.
Genakos et al. (2018)	Telecommunications	10-percentage point increase HHI leads to a price increase of 20%.
Houde (2012)	Petrol	Prices increased between 0.15 and 0.45 cents per liter after vertical mergers, or at most a 0.7% price increase.
Hovhannisyan et. al. (2019)	Retail food	5% increase in HHI would lead to a 18% increase in prices.
Lopez et. al. (2002)	Food-processing industries	1% increase in HHI can lead to a price increase between 1%-6%.
Matsa (2011)	Retail food	Inventory shortfalls decreased by up to 24% after Wal-Mart entry.
Russell (2021)	Education	Tuitions and fees increased between 7% and 9% after merger.
Stiebale and Szuecs (2022)	132 different 4-digit NACE industries	Merger and Acquisitions (M&A) can increase the markups of rival firms between 2% and 4%.

Source: Project Team based on bibliography assembled for literature review

2.2 Mobile telecoms: prices

Over the past 15 years, the mobile telecommunications industry has been under the scrutiny of antitrust authorities and regulators because of increasing consolidation through intense merger activity. The industry has experienced several four-to-three mergers around Europe and beyond, thus increasing market concentration on a global

scale. Over the same period, some mergers have been blocked by competition authorities, including the European Commission.[134] However, the wave of consolidation is far from over. Between 2018 and 2020 the third and fourth largest Mobile Network Operators (MNOs) in the U.S. consummated a (much debated) four-to-three merger (Sprint/T-Mobile). In July 2022, the second and fourth largest MNOs in Spain announced that they had reached an agreement to merge their operations in Spain, another four-to-three merger. This trend towards consolidation is also observed in developing countries. For example, in October 2022, the Thailand Telecommunications Regulator (NBTC) approved, with remedies, a three-to-two merger between True Corporation and DTAC, Thailand's second and third largest MNOs.

Within this general consolidation trend, the industry has also experienced the increasing entry of Mobile Virtual Network Operators (MVNOs). These telecommunications service providers do not possess their own frequency spectrum and infrastructure, but instead lease MNOs' network facilities. However, it is unclear to what extent MVNOs can exert true competitive pressure in the mobile telecommunications industry and, for instance, affect average MNO pricing decisions. On the one hand, MVNOs may seem to add substantial pricing constraints on MNOs. In support of this, one stylized fact is that MVNO prices are considerably lower than those of MNOs. On the other hand, MNOs (who provide the capacity for MVNOs) may expect a segmentation of customers between price sensitive ones (who select MVNOs) and less price sensitive ones (who stock with MNOs). This segmentation of customers could actually allow the MNOs to raise prices as the more price sensitive customers are shaved away.[135]

In this section, we study the relationship between price and market structure in the mobile telecommunications sector. Our empirical approach analyses the experience of 29 countries over the period 2009-2019. The dataset covers the so-called 4G era, and the long time period allows us to exploit substantial variation in market structure induced by new MNO entry (via licensing), MNO exit through mergers, changes in concentration (HHI), as well as growth in the number of MVNOs.[136] The mobile telecommunication industry provides an ideal setting for a cross-country panel study on the relationship between market structure and prices. In fact, differently from other industries, mobile telecommunications is not a free-entry industry. Instead, operators need to be awarded spectrum licences to operate in the market. Therefore, the regulatory environment of different countries is crucial in determining the number of MNOs in a market, thus reducing potential empirical issues from endogenous entry. Overall, our results point to a strong and significant positive relationship between market concentration and prices. In particular, our estimates suggest that one additional MNO is associated with a reduction in average revenues per user (ARPU) by 7%. The impact is mostly driven by EU countries, in which one additional MNO is associated with a 9% reduction in ARPU.

When using country HHI as the main variable to measure market structure, we implement an instrumental variable approach that employs two complementary

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[134] For example, in case M.7612, the European Commission issued decision 2016/C 357/08 which was subsequently followed by the General Court Judgment C-376/20 P Commission v CK Telecoms UK Investments.

[135] MNOs can implement price discrimination by setting up their own MVNO, thus attracting price sensitive consumers to the low-quality MVNO brand. As a result, MNOs may increase prices to favour segmentation and reduce cannibalisation. In this setting, MVNOs are a source of (vertical) product differentiation rather than a competitive threat. Cf. Ennis (2006).

[136] Our baseline empirical strategy implements a fixed effect estimation, exploiting plausibly exogenous variation in market structure in the countries analysed.

instruments, namely the number of MNOs and the difference in mobile termination rates (MTRs) in each country and point in time. MTRs are payments an operator has to make when it wants to terminate the call on a rival's network. Regulators have repeatedly regulated MTRs, for instance, by imposing asymmetric conditions between large and small MNOs to level the playing field between historical incumbents and new entrants. Ultimately, the within-country difference in MTRs should correlate with market concentration without a direct effect on prices. Our estimates suggest that 1,000 points increase in HHI is associated with 11-18% increase in ARPU. Finally, our assessment of the effect of MVNOs on market prices suggests that variation in the number of MVNOs has negligible effects on MNOs' ARPU.

2.2.1 Industry background and literature

As described in section 2.1 there is evidence that higher market concentration is positively related to higher prices. Such an empirical regularity holds true also in mobile telecommunications. Genakos et al. (2018) exploit the wave of consolidation in the mobile telecommunications industry of selected OECD countries during the period 2002-2014 to document the rise in consumer prices induced by the rise in market concentration. They find a typical price increase of 20% from a 10 percentage point increase in HHI.

More recently, Bourreau et al. (2021) study the welfare implications of the entry of a new MNO in the French market (i.e., a three-to-four change in market structure) that happened in 2012. They find that MNOs reacted to the new entry by strategically introducing subsidiary low-cost brands (the so-called fighting brands), which further increased product variety in the market. Moreover, the fighting brand strategy can be rationalized as a breakdown of tacit collusion in which, before entry, incumbents could restrict product lines to avoid cannibalization. As a result, consumers benefited from the entry of a new MNO in terms of (i) higher variety coming from mobile services offered by the new MNO and the incumbents' low-cost brands, and (ii) lower prices from the increased competition. Elliot et al. (2023) develop a structural model of demand and supply in which a trade-off emerges between concentration, prices, and quality of the service. Lower concentration reduces prices but also quality (measured by connection speed), with non-trivial effects on consumer welfare. By estimating the structural model using data from the French mobile market, they argue that, while consumer surplus is maximized when six MNOs operate in the market, total welfare is maximized with only three MNOs.

The literature also emphasizes the role of institutions in fostering competition, particularly in mobile telecommunications. Philippon (2019) argues that "the combination of ex-ante market access regulation and ex-post enforcement has made the EU telecom markets more competitive [than in the U.S.], providing consumers and businesses with increased choice, affordable prices, high quality, and innovative services." This intuition is consistent with the empirical findings of Faccio and Zingales (2022), who show that both pro-competitive rules and antitrust enforcement are key in shaping market structure, thus significantly reducing prices. By comparing the US and EU markets, the authors estimate U.S. consumers would gain $65 billion a year if U.S. mobile service prices were in line with German ones, and $44 billion if they were in line with Danish ones.

We contribute to the literature in two ways. First, we provide novel empirical evidence on the relationship between market concentration and prices in mobile telecommunications, exploiting an original dataset covering the 4G era. Second, given the lack of empirical evidence on the role of MVNOs' in affecting market efficiency, we aim to assess the impact of MNVOs' entry on MNO prices.

2.2.2 Data and outcomes

We gather data on 29 countries for the period 2009-2019 from a database maintained by the main international association of mobile telephone operators.[137] The analysis includes developed economies around the globe with 23 EU countries, as well as North American (Canada and US), Asian (Japan and South Korea), and Oceanian (Australia and New Zealand) countries. 2019 is chosen as the concluding data point to avoid confounding demand and supply factors that might have been related to the Covid-19 pandemic.

The data includes detailed information for every active MNO. We can derive the (country-level) number of active MNOs at each point in time (quarter), representing our first measure of market structure.[138] Moreover, the data also provides quarterly MNOs' market share as "[t]otal connections at the end of the period, expressed as a percentage share of the total market connections." We use this measure to compute the HHI as the sum of the squared market share across all operators in each country and quarter.

In mobile communications, pricing is a complex issue, with fixed and usage-based price components, and the pricing schedules/profiles that change over time and country. Hence, choosing the "right" measure of price in this industry is not an easy task. One approach that has been used by the literature is the so-called basket approach (Genakos et al., 2018), which measures the price of a fixed bundle of mobile services for different usage profiles. The advantage of this approach is that it derives from observed prices in the marketplace. However, it has three shortcomings. First, it assumes consumers choose the tariff that is best for them, which may not be always the case.[139] Moreover, it would not capture below-the-line offers, as well as potential price increases made to existing customers. Third, in a time series analysis, a fixed basket may not be fully reflective of actual prices paid by consumers, particularly as technology and preferences evolve, and plans selected by consumers change.

The second approach, which is the main one used in this study, is to use ARPU.[140] The main advantage of this metric is that it is a simple measure of how much consumers spend over time without imposing any assumption on their decision-making. However, shortcomings are also present in this case. First, ARPU may also include other sources of revenues not stemming from subscribers. Second, revenues depend on mobile service usage. Hence, variation in ARPU may reflect changes in consumption level and composition rather than actual price changes. We acknowledge the limitations of ARPU as a proxy of price, and we run a series of robustness checks with an alternative price

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[137] The source is the GSMA Intelligence platform (GSMA-I). GSMA is an association of nearly 800 operators and more than 250 companies in the broader mobile sector. It provides extensive global mobile data for 237 countries and territories: data cover every mobile operator group, network, and mobile virtual network operator in every country worldwide. See https://www.gsmaintelligence.com/.

[138] We performed a basic cleaning in order to exclude small MNOs that are present in the data. In particular, we excluded MNOs that have market shares below 5% within the panel. However, results are not significantly affected by this cleaning (see Table B.7in the Annex)

[139] Evidence that consumers do not always choose the best tariff includes quantitative findings that MVNOs charge lower prices than MNOs but are, in aggregate, much smaller in terms of number of subscribers. The MVNO distribution method and average service and reception quality level may differ in unobserved ways, though.

[140] We also run a robustness check using publicly available pricing data based on the basket approach, finding similar results.

measure obtained from publicly available sources, which confirm our main results.[141] Despite the acronym, ARPU is measured as the average revenue per connection, not per subscriber.[142] Most importantly, this metric reflects solely the revenues for the mobile phone segment, thus is not confounded by revenues from fixed broadband.[143] Moreover, for multinational operators the data are reported separately for each country. Therefore, ARPU varies over time (quarter), country, and MNO.

The data source provides also the list of MVNOs active in each country. The dataset includes information on the date of entry and exit for each MVNO, from which we can derive the number of MVNOs in each country and at each point in time. Additionally, the data contains information on the ownership structure of MNOs. In particular, we observe the group owning the MNOs operating in each market, which will be used to investigate the extent of multi-market contact in Europe. We complement our dataset with country-level demographic and economic variables such as countries' population, per-capita GDP, share of economically active population, share of population in urban areas, and share of population above 65 years old.[144]

Finally, we obtain information on Mobile Termination Rates (MTRs) from the Body of European Regulators for Electronic Communications (BEREC) annual reports. The reports include detailed information on operators' MTRs in each EU country on a yearly basis. As previous reports are not publicly available, we collected data from 2012 to 2019, and we generate country-level measures of average MTR, together with its standard deviation. We use both information in our instrumental variable approach when estimating the impact of the variation in HHI on prices.

Summary Statistics

Table B.1 provides key summary statistics of the variables included in the analysis, while Table B.2 collects the list of countries together with the number (and its variation) of MNOs at the beginning (Q1 2009) and at the end of the panel (Q4 2019). As can be seen, the large set of countries and the long period allows us to exploit significant variation in the number of MNOs within the panel, induced by either entry (via licensing) or exit (via merger).

Our dataset confirms some well-documented empirical regularities from the economic literature. First, from Figure 2.1 (left panel), we observe that the average ARPU is considerably higher in the U.S. compared to the EU (in line with Philippon, 2019). Although in both regions ARPU is decreasing over time, the trend is much stronger in the EU (right panel), thus suggesting an even larger differential compared to the U.S. over time.

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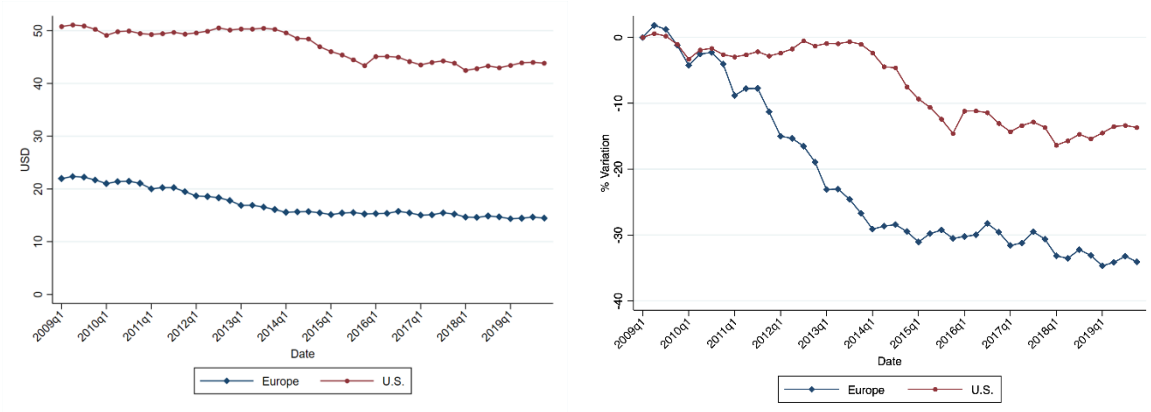
[141] In particular, we gathered price data from the publicly available Information Telecommunications Union (ITU) dataset, which provides yearly country-level information on average prices using the basket approach. We complement the analysis on ARPU from GSMA-I with ITU basket approach data, thus checking the consistency of the results using two different measures of price.

[142] As stated by GSMA, ARPU in its GSMA-I database is the "[t]otal recurring (service) revenue generated per connection per month in the period. Despite the acronym, the metric is strictly average revenue per connection, not per subscriber".

[143] The data is based on operator reports. In most cases, operators report mobile and fixed separately but in the few cases that mobile revenue, and by extension CAPEX, includes a fixed element, it is flagged on the GSMA-I platform.

[144] While country population is quarterly, the other variables are at yearly basis.

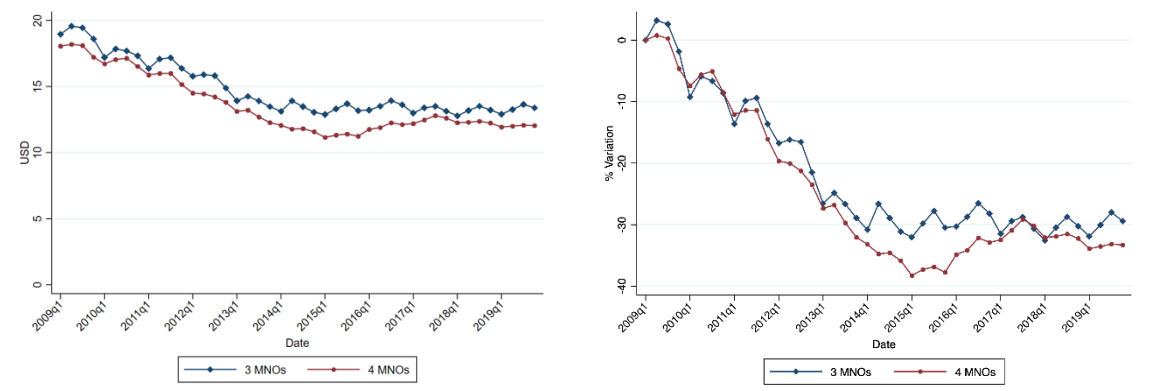
Figure 2.1: Evolution of ARPU in European countries and the US: ARPU levels (left), ARPU normalized % variation (right)



Source: Project Team based on GSMA-I data

Second, countries with fewer market players are characterized by a higher average ARPU. In Figure 2.2 we compare the trend in ARPU for EU countries with three and four MNOs throughout the time frame of analysis. That is, we focus on markets that are characterised by different market structures and that do not experience either new entry or merger activities within the panel.[145] From the left panel, we observe that EU countries with three MNOs have consistently higher average ARPU compared to countries with four MNOs. Notably, as shown in Figure 2.2 (right panel), the negative trend is very similar across the two categories, thus suggesting that the difference in ARPU is likely to persist in the long run.

Figure 2.2: Evolution of ARPU in European countries based on the number of MNOs in the first period (Q1 2009): ARPU levels (left), ARPU normalized % variation (right)

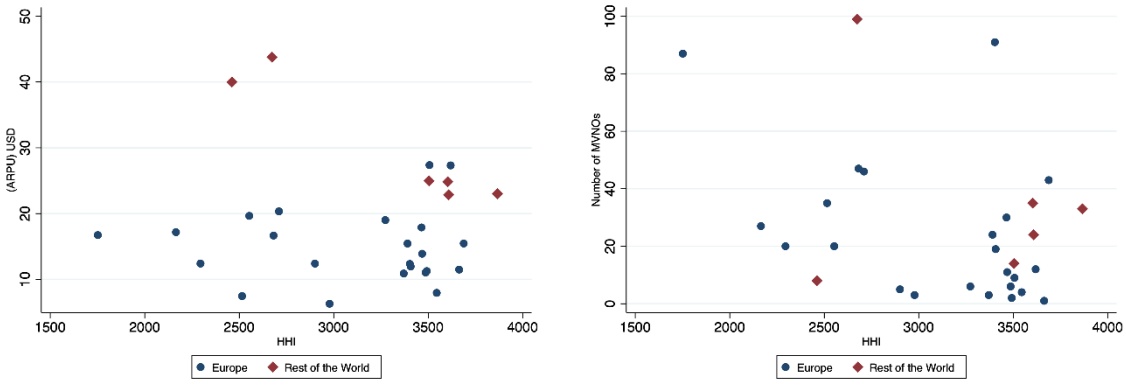


Source: Project Team based on GSMA-I data

[145] Clearly, such a preliminary empirical exercise does not account for underlying cross-country differences that may explain the variation in ARPU. For this reason, we estimate a fixed effect model that controls for unobservable country-specific factors affecting market structure and prices. The group of countries with three MNOs include Belgium, Czech Republic, Estonia, Finland, Greece, Hungary, Latvia, Lithuania, and Portugal. The group of countries with 4 MNOs: Denmark, Poland, Romania, Spain, and Sweden.

Third, the data points to a positive correlation between concentration and average prices, at least for Europe. Figure 2.3 (left panel) shows a scatter plot between countries' average ARPU and HHI, both at quarterly frequency. While we observe a positive correlation for Europe, the correlation is instead negative for the rest of the world. This shows that an examination of the raw data that does not account for other differences across countries makes a causal interpretation of the effect of market structure on prices difficult. Moreover, we also observe a positive correlation between market concentration and MVNO presence, as shown by Figure 2.3 (right panel).

Figure 2.3: Correlation between market concentration and average prices (left), and market concentration and number of MVNOs (right) in Q4 2019

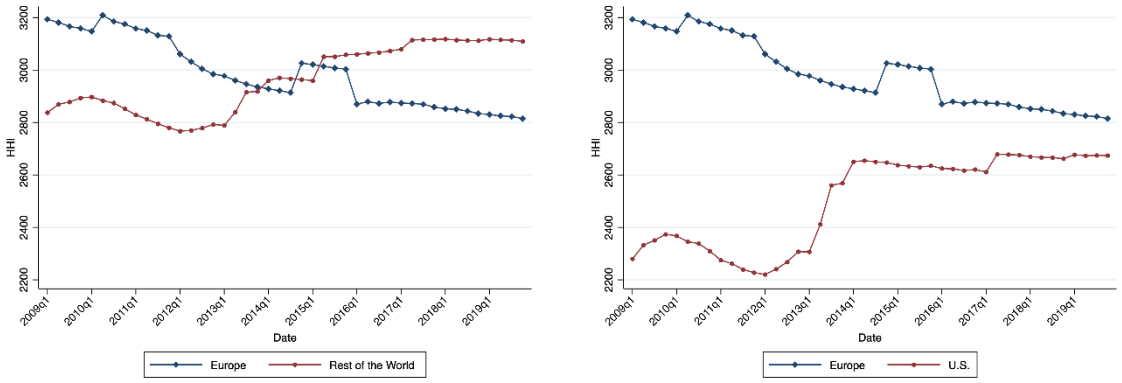


Source: Project Team based on GSMA-I data

Fourth, there is a striking difference between the evolution of concentration in Europe compared to non-EU countries over time: Concentration declined in Europe, while outside Europe it increased. Figure 2.4 (left panel) displays the trend in the average HHI in Europe compared to the rest of the world during the period 2009-2019.[146] In Europe, the HHI moved from 3,200 in the first quarter of 2009 to around 2,800 in the last quarter of 2019, implying a 30% reduction in ten years. At the opposite end, the HHI rose in the rest of the world reaching, by the end of 2019, an average level of concentration similar to the one Europe had ten years before. Such a diverse evolution of concentration holds true also if one compares Europe with the U.S. While at the beginning of 2009 the HHI in the U.S. was much lower than the average European HHI (by almost 1000 points,) by the end of 2019 the difference between them amounts to just 200 points. Moreover, if one considers the merger between Sprint and T-Mobile happening in 2020, then one could expect an even larger HHI in the U.S. for more recent years.

[146] *We obtained an aggregate measure of HHI by computing an average HHI weighted by country-level number of connections.*

Figure 2.4: Evolution of HHI in Europe compared to the rest of the world (left panel) and compered to the U.S. (right panel)

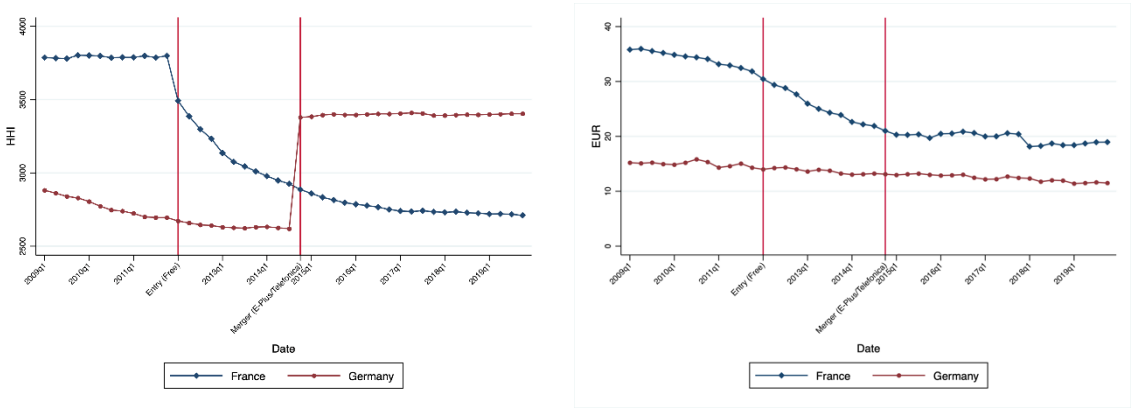


Source: Project Team based on GSMA-I data

Fifth, both entry and merger are shocks that significantly affect market structure. As an example, Figure 2.5 shows the evolution of the HHI in France, which experienced the entry of a new MNO in Q1 2012, and in Germany, where a much-debated merger was consummated at the end of 2014 (with some remedies were imposed to counteract the effects of the merger). As can be seen, both shocks (i) provide a significant discontinuity in the HHI, and (ii) they affect market structure in the long-run, thus changing permanently the competitive landscape. As could be expected, entry leads to a gradual decrease in concentration, as entrants need some time to penetrate the market. In contrast, mergers lead to a one-time increase that in this case remained relatively stable. This evidence reinforces the relevance of using variation in the number of MNOs induced by merger/entry in our empirical analysis as relevant shocks affecting market structure.

When investigating how such shocks can affect prices (right panel), we observe a significant reduction in average ARPU following entry in France, but negligible effect from the merger in Germany. However, such a before-after evidence is prone to omitted variable bias since unobservable factors other than the merger may affect average ARPU. Nonetheless, we can test if, following mergers or entry, we observe a variation in prices compared to geographical markets that do not experience them, thus accounting for shocks that are unobserved to the econometrician. This is the main reasoning behind our empirical strategy described below.

Figure 2.5: The impact of entry and merger on market concentration (left panel) and ARPU (right panel)



Source: Project Team based on GSMA-I data

Finally, our data allows us to obtain some insights into the extent of multi-market contact in the European mobile telecommunications industry. Table B.3 in the Annex focuses on the largest telecom groups operating in the EU and provides information on their presence within Europe in the last period of analysis (Q4 2019). Vodafone is the group operating in more markets (11), followed by Telia (8), Orange and Deutsche Telekom (7). The maximum level of overlapping, that is the highest number of countries in which two groups interact, is four. Vodafone plays a major role, as it competes in four markets with Orange (Poland, Portugal, Romania, and United Kingdom) and Deutsche Telekom (Czech Republic, Germany, Netherlands, and United Kingdom). Also, Telia and Telenor interact in four countries, essentially in Nordic countries (Denmark, Finland, Norway, and Sweden), as well as Telia and Tele2 (Estonia, Latvia, Lithuania, and Sweden). These indicators are based on the standard measure of simple overlap, which seems appropriate for the mobile sector due to relatively high market share of each player in each market.[147]

Empirical strategy

To identify the effect of concentration on prices, we adopt a panel data approach with fixed effects for countries and time periods, exploiting variation in market structure. We measure market structure by means of the number of MNOs and HHI in each country and point in time. When using the number of MNOs as main variable of interest, identification requires such a variable to be uncorrelated with unobservable factors affecting the price. This would happen if, for instance, entry is the result of a shift in demand of mobile services, which in turn would affect market prices. However, as suggested by Genakos et al. (2018), the mobile industry is not a free-entry industry. Instead, operators need to be awarded spectrum licences to operate in the market. As spectrum allocation does not depend on market conditions, but rather on the regulatory environment of the different countries, variation in the number of MNOs is not driven by endogenous entry.

However, while entry can be seen as plausibly exogenous, this is less true for exit through M&A. Although antitrust enforcement plays a prominent role in allowing

[147] *The appropriateness of this indicator for an industry with more variation in overlap would be more open to question, as Cruz-García et al. (2021) suggest an intensity indicator of multi-market overlap may be more appropriate for banks competing via branch presence.*

mergers between MNOs, posing an additional regulatory constraint on the number of MNOs, a merger is the outcome of an endogenous decision made by the MNOs. Such a decision may derive from unobservable market conditions correlated with prices, posing an endogeneity issue. One way to test the severity of this issue is to exclude mergers from the analysis, thus focusing on variations in the number of MNOs coming from entry. We run this additional analysis as a robustness check, finding results that are comparable with those obtained by also including mergers. Therefore, the remaining endogeneity from merger activity does not appear to significantly bias our results, thus reassuring on the validity of our research design.

A second measure for market structure used in the empirical analysis is the HHI. The use of HHI allows us to exploit more within-country variation in market structure. However, endogeneity concerns arise as measuring HHI involves using market shares, which are in turn influenced by prices. To account for the endogeneity of HHI, we apply an instrumental variable approach, using two complementary instruments. The first one, following the previous discussion, is the number of MNOs, the main identifying assumption being that variation in the number of MNOs, either through merger or entry, affects prices only through the variation in market concentration. Second, we use difference in MTR in country and point in time. MTRs are payments an operator faces when it wants to terminate the call on rivals' network. As pointed out by Genakos et al. (2018), regulators have repeatedly regulated MTRs, for instance, by imposing asymmetric conditions between large and small MNOs. In doing so, they aimed to level the playing field between historical incumbents and new entrants. Therefore, while the level of MTRs can affect prices, the within-country difference should correlate with market concentration without a direct effect on prices. Therefore, we use the within-country standard deviation in MTRs as an additional instrument in the instrumental variable estimation.

Results

Table 2.2 reports the results of our estimation where the main variable of interest is the number of MNOs in a given country and time period (see Annex B.1 for a formal definition).[148] In the initial two estimations based on EU and non-EU countries, the coefficient of the number of MNOs is negative and statistically significant, suggesting that having more operators in a country is correlated with a lower ARPU in the market. The estimated coefficients suggest that one additional mobile operator is associated with a 7% reduction in ARPU.[149] The positive relationship between market concentration and price holds true also in an estimation limited to Europe, in which one additional MNO is related to a reduction in ARPU by 9% on average (column 3).

[148] Column 1 includes only country and year fixed effects, while in column 2 we add time-varying economic and demographic country-level controls.

[149] Moreover, adding relevant time-varying controls does not change drastically the point estimate, suggesting that omitting some relevant control variable does not bias our estimates.

Table 2.2: Fixed effect estimates

Variables	*(1)* *All data*	*(2)* *All data*	*(3)* *Europe*	*(4)* *All data*	*(5)* *Europe*
MNO	-0.074***	-0.069***	-0.093***	-0.071***	-0.093***
	(0.011)	(0.012)	(0.013)	(0.012)	(0.013)
MVNO				-0.000	-0.000
				(0.000)	(0.000)
log(Population)		-0.753***	-1.676***	-0.735***	-1.672***
		(0.197)	(0.225)	(0.200)	(0.230)
log(Percapita GDP)		0.126**	0.418***	0.121**	0.417***
		(0.051)	(0.075)	(0.051)	(0.075)
Urban		-0.021***	0.010*	-0.021***	0.010*
		(0.006)	(0.006)	(0.006)	(0.006)
Plus65		-0.034***	-0.035***	-0.034***	-0.035***
		(0.008)	(0.010)	(0.008)	(0.010)
Active		0.019***	-0.001	0.019***	-0.001
		(0.005)	(0.006)	(0.005)	(0.006)
Observations	4,337	4,337	3,477	4,337	3,477
R-squared	0.866	0.869	0.852	0.869	0.852

*Source: Project Team. Note: The dependent variable is the natural logarithm of operators' ARPU. All regressions include country and time fixed effects. Urban, Plus65, and Active are country-level demographics representing the share of population living in urban areas, the share of population older than 65 years old, and the share of active population in the labour market, respectively. Data cover the period 2009-2019. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table presents the estimates of equation (1), defined in Annex B.1.*

The prior estimates do not include the MVNOs as a factor that could affect the prices. Columns 4 and 5 further include the number of MVNOs in the regression.[150] The estimated effect of MNO on prices remains negative, highly significant, and of similar magnitude, thus reassuring on the robustness of the results. What is more, MVNO estimates are very close to zero and not statistically significant, which suggests that virtual operators pose a negligible competitive constraint on MNO pricing. This could be explained by a phenomenon observed in Ennis (2006) in which splitting customers into segments by price sensitivity appeared associated with lower prices for the lower-priced international telephone calling plans but higher prices for the more expensive basic plans, a phenomenon that may have extended with the introduction of MVNOs owned by MNOs.

[150] *In this way, we assess whether the price effect is affected by the inclusion of an additional covariate that is possibly positively correlated with MNOs' ARPU, and whether such correlation is statistically significant.*

Table 2.3: IV estimates

Variables	*(1) OLS*	*(2) IV*	*(3) OLS*	*(4) IV*	*(5) IV*	*(6) IV*
HHI	0.593***	1.127***	0.673***	2.288	1.766***	1.840***
	(0.194)	(0.325)	(0.198)	(1.664)	(0.306)	(0.404)
MVNO						-0.005
						(0.014)
log(Population)	-1.909***	-1.945***	-2.327***	-2.416***	-2.387***	-2.244***
	(0.273)	(0.275)	(0.313)	(0.305)	(0.313)	(0.598)
log(Percapita GDP)	0.359***	0.350***	0.547***	0.471***	0.495***	0.527***
	(0.069)	(0.070)	(0.104)	(0.147)	(0.106)	(0.122)
Urban	-0.023**	-0.021**	-0.005	0.001	-0.001	-0.006
	(0.010)	(0.011)	(0.010)	(0.013)	(0.010)	(0.016)
Plus65	-0.028**	-0.026**	-0.011	0.010	0.003	-0.001
	(0.013)	(0.013)	(0.013)	(0.028)	(0.014)	(0.016)
Active	0.008	0.006	-0.012	-0.019**	-0.017*	-0.020*
	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.012)
log(MTR)			0.009	0.003	0.005	0.005
			(0.018)	(0.018)	(0.018)	(0.019)
Sample	All data	All data	Europe	Europe	Europe	Europe
First Stage F-test		1539		49.10	539.2	13.26
Observations	3,132	3,132	2,511	2,511	2,511	2,511

*Source: Project Team. Note: The dependent variable is the natural logarithm of operators' ARPU. All regressions include country and time fixed effects. Urban, Plus65, and Active are country-level demographics representing the share of population living in urban areas, the share of population older than 65 years old, and the share of active population in the labour market, respectively. For comparability across columns, the panel is restricted to the period 2012-2019, due to lack of MTR data before 2012. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table presents the estimates of equation (1), defined in Annex B.1.*

The previous results are informative on the impact of variation in market structure on price. However, they do not account well for the impact of entry and mergers of different sizes. For this reason, we re-estimate the empirical model using as main variable of interest the HHI. When doing this, an additional estimation challenge arises due to the endogeneity of market shares and prices. As explained above, we follow Genakos et al. (2018) identification strategy which exploits variation in the number of MNOs and within-country mobile termination rates (MTRs) as instruments for HHI. Consistently with previous results, Table 2.3 suggests a positive relationship between market concentration and prices. Better controlling for the likely relationship between price and market structure, the estimate from Column 2 points to a 11% increase in ARPU from

1,000 points increase in HHI.[151] Columns 3-6 focus on Europe only and include MTR as an additional control. When using difference in MTR alone as an instrument, the HHI coefficient increases significantly in magnitude, but the estimate is very imprecise, i.e. not significantly different from zero in a statistical sense (column 4). When we further add the number of operators as an instrument (column 5), the coefficient is sizeable and significant, pointing to around 18% increase in ARPU from 1,000 points increase in HHI.[152] Finally, in column 6, consistently with previous results, we find a small and non-significant effect of MVNOs on MNOs' ARPU.[153] [154] [155]

Finally, we can use the estimates from the econometric analysis to obtain the average ARPU that would emerge in Europe without any merger or entry. In particular, we use the estimated MNO coefficient from Table 2.2 Column 3 to construct the counterfactual mean ARPU in each EU country that experienced a variation in the number of MNOs. Figure 2.6 shows the evolution of the observed mean ARPU in Europe (solid line) together with the ARPU that would emerge absent mergers (left panel) or entry (right panel). Given the estimated negative relationship between the number of MNOs and ARPU, absent the merger we would observe a lower average ARPU. On the other hand, without entry ARPU would be higher than the observed one. Overall, the two charts highlight a meaningful variation in ARPU induced by variations in market structure.

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[151] Moving from OLS to IV estimation (Column 1 and 2, respectively) significantly increases the coefficients estimates, suggesting an endogeneity bias.

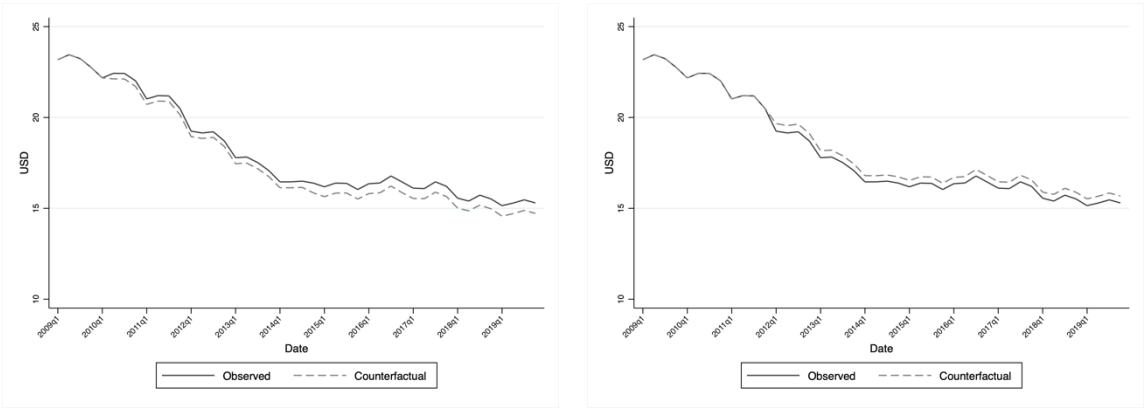
[152] The possibility of a relationship between structure and price, under exogenous conditions, is further supported by the findings in section 2.1.

[153] Since we have two excluded instruments, we can account also for the endogeneity of the number of MVNOs.

[154] The excluded instruments (number of MNOs and MTR) appear to be relevant in explaining variation in the endogenous variables as first stage coefficient estimates are significant and of the expected sign (see Table C.7 in the Annex). The number of MNOs negatively correlates with the HHI, and so it does the within-country standard deviation in MTR, which is consistent with the idea that differences in MTR reflects the intention of the regulators to level the playing field between large and small MNOs. For a similar reason, difference in MTR is positively correlated with MVNOs number, while the number of MNOs is negatively correlated. This might be due to the increased competition posed by additional MNOs in the market, which may prevent the entry of virtual operators.

[155] Note that all results in this section have also been calculated using PPP adjustments in exchange rates for ARPU as opposed to the reported contemporaneous rates. This alternative specification does significantly affect the results and figures also look very similar.

Figure 2.6: Counterfactual Evidence on ARPU from mergers (left panel) and entry (right panel) in Europe



Source: Project Team based on GSMA-I data

2.2.3 Conclusions

Overall, our results point to a strong, positive relationship between prices and market concentration in mobile telecommunications, while the role of MVNOs appears to be negligible. A series of robustness checks confirm our main results. First, we use an alternative pricing measure based on the basket approach using the publicly available ITU data. These data have several limitations, as (i) data are available only for the mobile-cellular low-usage basket, and (ii) data are aggregated at the country level and at yearly frequency. Despite these limitations, we still observe a positive relationship between price and market concentration (Table B.5), although the estimates are much less precise due to the data limitation. Second, we exploit variation in the number of MNOs from entry, which is less likely to suffer from endogeneity concerns. Again, we find that an increase in the number of MNOs is associated with lower ARPU (Table B.6). Lastly, results are not significantly affected by the inclusion of small MNOs (below 5% market share within the time frame of analysis). If anything, the lower magnitude of the estimated coefficients (Table B.7) is consistent with the idea that entry/exit of small MNOs provides little effect on market prices.

Our results highlight that MVNOs do not provide a significant competitive constraint on MNOs' prices. However, it is worth noting that consumers can benefit from MVNOs' entry from the increased variety in the market. For instance, Bourreau et al. (2021) argue that, after the entry of Free Mobile, consumers gained more from the increased variety offered by the new entrant and low-budget MVNOs rather than incumbents' price responses. This suggests that the entry of MVNOs may increase competition over important non-price dimensions to the benefit of consumers. Moreover, by increasing the demand for higher capacity, MVNOs may stimulate MNOs' investment in broadband infrastructure. This is more likely to happen when the gains from leasing the infrastructure outweigh the potential loss deriving from higher competition in the market which, according to our estimates, appear to be negligible. Consistently, in the next section we provide evidence of a positive relationship between investment and MVNOs' entry. Finally, it is worth noting that variation in the number of MNOs came mainly from either four-to-three mergers or three-to-four entry. On the one hand, this was particularly convenient for the empirical analysis, since we could compare countries characterized by a similar market structure. On the other hand, it challenges the external validity of the results. In other words, it remains unclear whether an

hypothetical five-to-four (or three-to-two) merger would lead to a similar increase in price as the one observed in the present study.

To better understand the economic significance of our findings, we perform a simple calculation on the cost savings for European citizens deriving from higher competition. In particular, we can use our estimates to compute the savings that would arise if all EU countries had four MNOs operating in the market. This is especially relevant since in the last period covered by our data (Q4 2019) 14 out of 23 countries have three MNOs. By using estimated coefficients from Table 2.2 column 3, we find that, all else equal, if the EU countries with three MNOs had four MNOs, there would be a total saving of approximately 788 million euros per annum, with average savings per country of approximately 56 million euros.

2.3 Mobile telecoms: investment

As discussed in the previous section, over the past 15 years, the mobile telecommunications industry has been under scrutiny by antitrust authorities and regulators because of increasing consolidation from intense merger activity. Mobile operators argue that, given the declining retail margins, consolidation is the only way to achieve the efficiency gains necessary to ensure future investments in broadband infrastructures. For instance, a press release concerning the proposed Orange-Masmovil merger by one of the merging parties states that: "The joint venture between MASMOVIL and ORANGE will create a sustainable player with the financial capacity and scale to continue investing to foster the future of infrastructure competition in Spain for the benefit of consumers and businesses. A joint venture between the two complementary businesses would lead to significant efficiency gains, allowing the combined company to accelerate investments in FTTH and 5G that will benefit Spanish customers."

The introduction of MVNOs may also have played a role in affecting investment incentives. On the one hand, if MVNOs raise overall revenues available to facilities-based providers, and cover the incremental costs of new investment, they may help to incentivise new investment. On the other hand, if MVNOs reduce the overall revenues compared to when there are solely MNOs present, their entry might result in lower investment levels. However, prior empirical exploration of the MVNO trade-offs is missing from the literature.

In this section, we study the relationship between investment and market structure in mobile telecommunications. We employ an empirical approach looking at the experience of 29 countries over the period 2009-2019. The dataset covers the so-called 4G era, and the large time frame allows us to use changes in market structure induced by new MNO entry (via licensing), MNO exit through mergers, variations in the HHI, as well as growth in the number of MVNOs. Our empirical strategy implements a fixed effect estimation, exploiting plausibly exogenous variation in market structure in the countries analysed, as well as an instrumental variable approach in the spirit of Genakos et al. (2018).

Our results point to a negative relationship between market concentration and investment. Aggregate statistics show that the U.S. displays higher investments and faster 4G roll-out compared to the EU. However, within Europe, countries with four MNOs perform better in terms of investment levels compared to countries with either three or five MNOs. Regression results show that a rise in the number of MNOs is positively associated with country-level investment in mobile telecommunications (+10%). However, when using the HHI as the main variable of interest, the estimates are persistently negative but rather unprecise. Finally, we observe a significant positive effect of MVNOs on aggregate investment (+0.3%).

2.3.1 Industry background and literature

Despite the large set of empirical studies documenting a generally positive relationship between market concentration and price, the evidence on how market structure influences investment in mobile telecommunications is rather scant and much more mixed.

Lestage et al. (2013) argue that greater competitive pressure fosters infrastructure investment by state-owned incumbents but reduces investment by private incumbents. Genakos et al. (2018) exploit the wave of consolidation in the mobile telecommunications industry of selected OECD countries during the period 2002-2014. They find that a rise in concentration increases investment per operator, as measured by operators' CAPEX. In particular, a hypothetical four-to-three symmetric merger would increase investment per operator by 19.3%. However, when looking at country-level aggregate CAPEX, they do not observe any significant effect. Faccio and Zingales (2022) find no evidence that a higher degree of competition leads to lower quality of service or less investment. However, when analysing the difference between the United States and Europe, the U.S. displays higher revenues per user but also better quality in terms of 4G coverage. Padilla et al. (2023) review some of the studies relevant to impacts from having four or three providers and critique prior studies, however do not present original empirical findings.

The literature provides also little evidence on the impact of MVNOs' entry on investment. Grajek and Röller (2012) suggest that access regulation (forcing incumbents to share their infrastructure with MVNOs) reduces incentives to invest in telecommunications infrastructure. However, it is unclear how voluntary access – as is usually the case of MVNOs – may affect investment incentives for mobile operators.

2.3.2 Data and outcomes

The dataset used in the analysis is the one described in section 2.3 on the relationship between market structure and price in mobile telecommunications.

However, in this setting, the main variable of interest is mobile capital expenditure (CAPEX), both at the operator and country levels (Genakos et al., 2018). Given available information on the number of connections (both at operator and country levels), we can compute average capital expenditure per unit, which is a more comparable measure across different countries.

We also gather information on 4G roll-out in the selected countries. That is, we observe the share of population covered by 4G connections in each country and quarterly, which has been used by Faccio and Zingales (2022) as a measure of quality of mobile services.

Although the dataset provides information on CAPEX per operator, the data present several holes without a clear pattern. In particular, 45% of observations have missing information on operators' CAPEX. On the contrary, aggregate country-level CAPEX data are well-defined throughout the panel, and this measure is not affected by the missing data at the operator level. Therefore, we use aggregate mobile CAPEX for the current analysis.

Summary statistics

The large set of countries and the long period considered allow us to exploit significant variation in the number of MNOs within the panel, induced by either entry via licensing or exit via merger (see Table B.2 collecting the list of countries together with the number (and its variation) of MNOs at the beginning (Q1 2009) and at the end of the panel (Q4 2019)).

A descriptive analysis of our dataset provides first insights into the relationship between investment and market structure in mobile telecommunications (see also Table B.2

which provides key summary statistics of all the variables included in this preliminary analysis). First, a simple comparison between Europe and the U.S. shows that the level of investment in the U.S. is considerably larger than in the EU. Figure 2.7 shows the evolution of total CAPEX (top panels) and CAPEX per unit (bottom panels) in the two regions. The level of investment in the U.S. is higher, both on aggregate (top-left panel) and per unit (bottom-left panel). In both regions, we observe a positive trend in investment over time. However, while aggregate CAPEX grows more in the EU (top-right panel), CAPEX per connection increases at the same rate on the two sides of the Atlantic (bottom-right panel), and at the end of the sample U.S. CAPEX per connection grows faster than in the EU. Overall, these pieces of evidence suggest a higher level of investment in the U.S. mobile telecommunication industry.

Figure 2.7: Evolution of aggregate CAPEX in Europe and the U.S: aggregate CAPEX (top-left), Normalized % variation (top-right), CAPEX per connection (bottom-left), Normalized % variation (bottom-right)

Source: Project Team based on GSMA-I data

Second, when focusing on the EU, the relationship between pre-existing levels of concentration and investment is not so clear-cut. We compare the trend in CAPEX for EU countries with three and four MNOs throughout the time frame of analysis.[156] In

[156] *That is, we focus on EU countries characterized by different market structures that do not experience either entry or exit during the period of analysis. The group of countries with three MNOs include Belgium, Czech Republic, Estonia, Finland, Greece, Hungary, Latvia, Lithuania, and Portugal. The group of countries with 4 MNOs: Denmark, Poland, Romania, Spain, and Sweden.*

other words, we focus on markets that are characterised by different market structures and that do not experience neither new entry nor merger activities within the panel. Figure 2.8 (top-left panel) shows that countries with four MNOs display a higher level of CAPEX, compared to European countries with three MNOs. However, countries with three MNOs experience higher growth in investment over time (top-right panel). The higher CAPEX in countries with four MNOs may just reflect market size, as larger markets support more operators and would then need more investment. For this reason, we also present CAPEX per connection (bottom left and right panels), finding that countries with three MNOs appear, *prima facie*, characterized by higher level of average CAPEX per connection. It must be borne in mind, however, that these figures are limited to countries with the same number of MNOs over time and country differences are not accounted for, such as differences in fixed costs that can be spread over more users in higher population countries. Simple cross-country comparisons based on averages are therefore insufficient to predict the impact of mergers. More robust estimation techniques are needed to obtain meaningful insights (see Results section below).

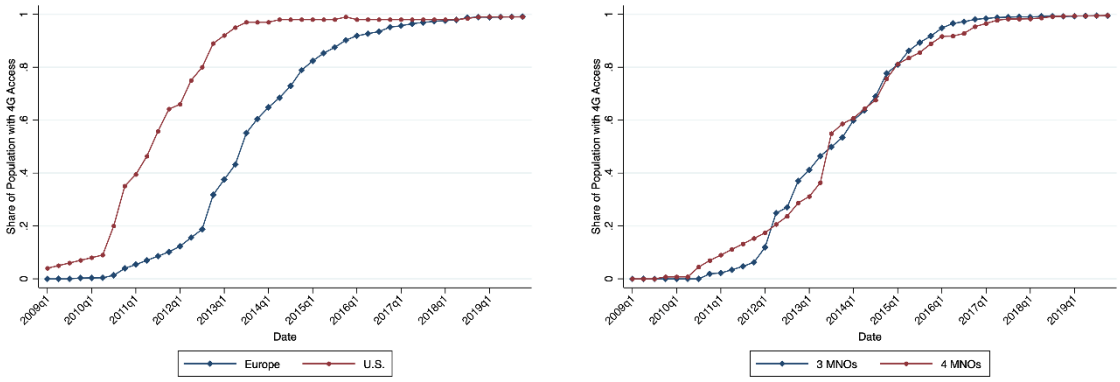
Figure 2.8: Evolution of CAPEX in European countries, by number of MNOs in the first period (Q1 2009): aggregate CAPEX (top-left), Normalized % variation (top-right), CAPEX per connection (bottom-left), Normalized % variation (bottom-right)

Source: Project Team based on GSMA-I data

Third, consistently with the higher investment observed in the U.S. compared to the EU, 4G roll-out has been much faster in the United States (Figure 2.9, left panel). However, when focusing on EU countries characterized by different levels of concentration at the

starting period of the analysis,[157] we observe that 4G roll-out has been similar across market with different concentration levels (Figure 2.9, right panel). This evidence is at odds with the conventional argument that a higher level of market concentration is necessary to sustain infrastructure investments for new broadband technologies.

Figure 2.9: 4G roll-out in EU and the US



Source: Project Team based on GSMA-I data

Results

We identify the effect of variations in market structure on investment in mobile telecommunications through a panel data approach with fixed effects for countries and time periods. As in the previous section, we measure market structure by means of the number of MNOs and HHI in each country and point in time. When using the number of MNOs as main variable of interest, identification requires such a variable to be uncorrelated with unobservable factors affecting the investment. On the other hand, the HHI allows us to exploit more within-country variation in market structure. However, endogeneity concerns arise as measuring HHI involves using market shares, which may be correlated with unobservable determinants of investment.

To account for the endogeneity of HHI, we apply an instrumental variable approach, using the two complementary instruments discussed in the previous section, namely the number of MNOs, and the difference in Mobile Termination Rate (MTR). Our empirical strategy is described in detail in Annex B.2.

Table 2.4 reports OLS estimation results when the main variable of interest in the number of MNO in a country. Column 1 includes only fixed effects, while in column 2 we add time-varying economic and demographic country-level controls. In both cases, the coefficient associated with the number of MNOs is positive and statistically significant, suggesting that the presence of more operators is associated with a larger CAPEX at market level. In particular, the estimated coefficient from column 2 suggests that one additional mobile operator is correlated with higher aggregate investment by 9%. The detected positive relationship holds true in Europe (column 3) with a similar magnitude. In columns 4-5 we observe that adding the number of MVNOs does not significantly affect the estimates of the MNO coefficient, thus suggesting that the estimation is not

[157] *Note that we focus on countries that did not experience either entry or exit during the period of analysis. The group of countries with three MNOs includes Belgium, Czech Republic, Estonia, Finland, Greece, Hungary, Latvia, Lithuania, and Portugal. The group of countries with 4 MNOs includes Denmark, Poland, Romania, Spain, and Sweden.*

biased by omitting relevant variables. Moreover, the coefficient associated to MVNO is positive and significant, implying that one additional MVNO is associated with a 0.3% increase in CAPEX.

Table 2.4: Fixed effect estimates

VARIABLES	*(1) All data*	*(2) All data*	*(3) Europe*	*(4) All data*	*(5) Europe*
MNO	0.056**	0.091***	0.109***	0.101***	0.116***
	(0.027)	(0.028)	(0.032)	(0.028)	(0.032)
MVNO				0.003**	0.003*
				(0.001)	(0.001)
log(Population)		0.774*	0.622	0.645	0.426
		(0.435)	(0.550)	(0.444)	(0.577)
log(Percapita GDP)		0.166	0.137	0.195*	0.161
		(0.112)	(0.135)	(0.111)	(0.133)
Urban		0.043***	0.040***	0.045***	0.043***
		(0.014)	(0.014)	(0.014)	(0.014)
Plus65		-0.078***	-0.086***	-0.079***	-0.084***
		(0.016)	(0.025)	(0.017)	(0.025)
Active		0.020*	0.028**	0.020*	0.026*
		(0.011)	(0.014)	(0.011)	(0.014)
Observations	1,276	1,276	1,012	1,276	1,012
R-squared	0.975	0.975	0.966	0.976	0.966

*Source: Project team calculations. Note: The dependent variable is the natural logarithm of country-level mobile CAPEX. All regressions include country and time fixed effects. Urban, Plus65, and Active are country-level demographics representing the share of population living in urban areas, the share of population older than 65 years old, and the share of active population in the labour market, respectively. Data cover the period 2009-2019. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table presents the estimates of equation (2), defined in Annex B.2.*

The previous results are informative on the impact of a variation in market structure on price. However, they do not account well for the impact of entry and mergers of different sizes. For this reason, we re-estimate our model using as main explanatory variable HHI. When doing this, an additional estimation challenge arises due to the potential endogeneity of market structure and investment. As explained above, we follow Genakos et al. (2018) identification strategy, which exploits variation in the number of MNO and within-country MTR variation as instruments for HHI. Table 2.5 collects estimated coefficient in such a case. From column 1, we do not detect any significant relationship between HHI and CAPEX. However, when we move to the IV estimates, the HHI coefficient becomes negative and significant, implying a 13.9% reduction in CAPEX from 1,000 points increase in HHI. The detected negative relationship holds true in Europe, although the estimates are not precise due to the high standard errors (columns

3-6).[158] Interestingly enough, the IV estimates confirm the positive impact of MVNOs on CAPEX (+4.7%).[159]

[158] *Since data are aggregated at the country level, the sample size is lower compared to the price study, thus affecting the precision of the estimates. This is particularly relevant in the IV approach since, (i) 2SLS estimates have larger standard errors compared to OLS ones, and (ii) we need to further restrict the sample to European countries. These data limitations affect the significance of the estimates. However, if anything the estimates point to a negative relationship between concentration and investment, which is consistent with previous results.*

[159] *Note that all results in this section have also been calculated using PPP adjustments in exchange rates for ARPU and CAPEX as opposed to the reported contemporaneous rates. This alternative specification does not significantly affect the results and figures also look very similar.*

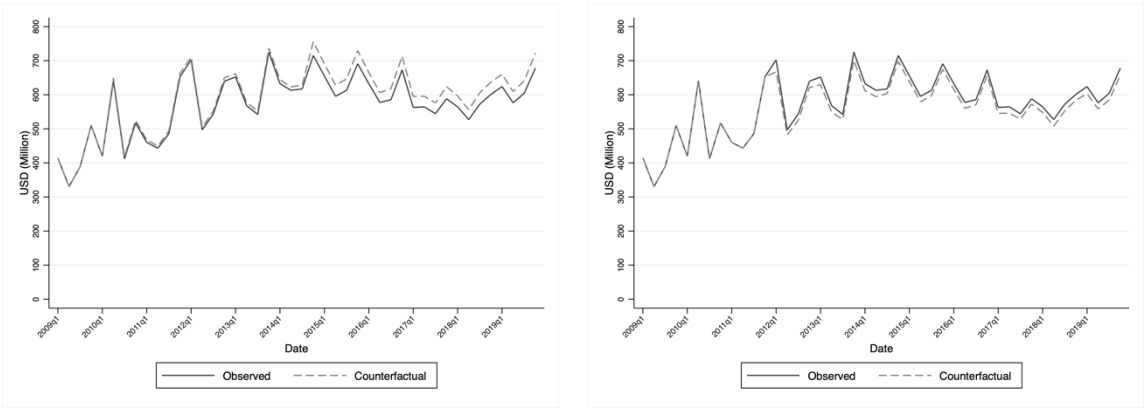
Table 2.5: IV estimates

VARIABLES	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) IV	(6) IV
HHI	-0.523	-1.386*	-0.410	-7.126*	-0.762	-1.598
	(0.365)	(0.812)	(0.370)	(4.135)	(0.890)	(0.986)
MVNO						0.047*
						(0.029)
log(Population)	-0.881	-0.820	-1.996***	-1.542*	-1.972***	-3.381***
	(0.616)	(0.619)	(0.747)	(0.880)	(0.753)	(1.170)
log(Percapita GDP)	-0.051	-0.034	-0.131	0.195	-0.114	-0.497*
	(0.127)	(0.126)	(0.141)	(0.254)	(0.137)	(0.277)
Urban	-0.039	-0.040	-0.033	-0.047*	-0.034	0.014
	(0.025)	(0.025)	(0.025)	(0.028)	(0.024)	(0.038)
Plus65	-0.132***	-0.134***	-0.122***	-0.209***	-0.127***	-0.093*
	(0.024)	(0.024)	(0.031)	(0.060)	(0.032)	(0.048)
Active	-0.016	-0.013	-0.032	-0.005	-0.030	0.007
	(0.015)	(0.015)	(0.019)	(0.027)	(0.020)	(0.032)
log(MTR)			-0.072*	-0.043	-0.070*	-0.075*
			(0.038)	(0.046)	(0.038)	(0.040)
Sample	All data	All data	Europe	Europe	Europe	Europe
First Stage F-test		447.2		10.92	151.2	4.112
Observations	928	928	736	736	736	736

*Source: Project team calculations. Note: The dependent variable is the natural logarithm of country-level mobile CAPEX. All regressions include country and time fixed effects. Urban, Plus65, and Active are country-level demographics representing the share of population living in urban areas, the share of population older than 65 years old, and the share of active population in the labour market, respectively. For comparability across columns, the panel is restricted to the period 2012-2019, due to lack of MTR data before 2012. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The table presents the estimates of equation (2), defined in Annex B.2.*

As we did in the price analysis, we can use the estimates to run a counterfactual analysis to compare the observed levels of investment with those that would emerge absent mergers or entry in Europe. We use MNO estimated coefficient from Table 2.4 Column 3 to derive the counterfactual CAPEX in each country that experienced a variation in the number of MNO. Figure 2.10 shows the observed European average CAPEX together with its counterfactual in the case mergers (left panel) or entry (right panel) did not occur. Given the estimated coefficient, without mergers we would observe a higher average CAPEX, while without entry a lower one would emerge. All in all, the charts suggest a meaningful negative relationship between country-level CAPEX and concentration.

Figure 2.10: Counterfactual Evidence on investment from mergers (left panel) and entry (right panel) in Europe



Source: Project Team based on GSMA-I data

2.3.3 Conclusions

This chapter provides an analysis of the impact of market concentration on investment in mobile telecommunications. We gathered on countries' aggregate CAPEX and market structure, presence of MVNOs, and 4G roll-out. Aggregate evidence shows mixed evidence on the relationship between concentration and country-level CAPEX. However, estimates from the empirical model highlight a negative relationship between concentration and investment. What is more, MVNOs seem to play a meaningful role in fostering investment in mobile telecommunications. This suggests that the higher broadband capacity demanded by MVNOs may stimulate MNOs investments in broadband infrastructure, and that the leasing of MNOs' infrastructure provides a source of revenues which outweighs the potential competitive threat that MVNOs can pose in the market.

A series of robustness checks confirm our main results. First, when we exploit variation in the number of MNOs from entry, which is less likely to suffer from endogeneity concerns, we still find that higher market concentration is associated with lower CAPEX. Second, results are not significantly affected by the inclusion of small MNOs (below 5% market share within the time frame of analysis). The lower magnitude of the estimated coefficients is consistent with the idea that entry/exit of small MNOs provides little effect on aggregate investment. Finally, using CAPEX per unit as the dependent variable does not alter the results either.

To better understand the economic significance of our findings, we perform a simple calculation on the additional investments that may derive from lower concentration in Europe. In particular, since in our analysis variation in the number of MNOs comes mainly from either four-to-three mergers or three-to-four entry, we can use our estimates to compute the savings that would arise if all EU countries had four MNOs operating in the market. This is especially relevant since, in the last period (Q4 2019) 14 out of 23 countries have three MNOs. By using estimated coefficients from Table 2.4 column 3, we find that, if the EU countries with three MNOs had four MNOs, and everything else being equal, there would be additional average quarterly investments for approximately 323 million euros (ca. 1.2 billion euros per annum), with average quarterly investment per country of approximately 23 million euros (ca. 92 million euros per annum).

2.4 Airlines

The airline markets in US and EU have been historically characterized by periods of low profitability, which spurred various forms of market restructuring (exit of inefficient players) and business transformation (e.g., the entry and the success of new low-cost airlines). One form of restructuring, particularly relevant in the context of the US airline markets, is consolidation in its two main forms: the formation of alliances between airlines, and mergers. The US industry has experienced important mergers that significantly reduced the number of legacy airlines and, although in Europe the trend has been less pronounced, it is possible that the European industry might follow a similar pattern in future years. European carriers remain relatively fragmented, although they are part of large alliances and some mergers have taken place in recent years. The airline industry is also facing important challenges ranging from its financial solidity (many operators, even before the COVID-19 pandemic, have been under financial distress and some went bankrupt) to the adoption of new technologies that would reduce its environmental footprint.

2.4.1 Industry background and literature

Industry background

The aviation industry, besides its economic importance, has been extensively studied due to its multifaceted dynamicity, ranging from the innovations taking place in the way the service is provided (e.g., the continuous push for more advanced aircrafts, or the early adoption ICT technologies), to the disruption determined by the entry of players adopting new business models,[160] and to the game of alliance formation, route entry and exit, and consolidation that saw operators constantly reshaping the competitive landscape of the industry.

The industry is characterized by important entry barriers, which are often an element that leads to high market concentration and, possibly to high markups. The main sources of entry barriers in the airline industry are the significant fixed costs and startup costs that operators have to bear (e.g., to buy or lease the aircrafts), the need to comply to the high safety standards, and the need to obtain access to the airports (and the related facilities) to operate a new route.[161]

Taking a 20-year perspective, the business of airlines has been characterized by repeated years of low profitability at the beginning of the 2000s[162], due to a combination of factors which include: the rising cost of fuel, the high concentration in the markets for aircrafts and avionics, the high cost of labour, and, importantly, the impact of 9/11

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[160] *The most relevant business model claiming space in the market throughout the first two decades of the 2000s, especially in Europe, is the one of Low Cost Carriers (LCC). This business model, which focuses on the minimization of operating costs through a reduction in the scope of the fleet (sometimes boiling down to just one aircraft model), the use of secondary airports, and the reduction in services (and the associated personnel costs), was first introduced in the US market at the beginning of the 1950s but became successful in the EU market in the first two decades of the 2000s, with the 2012 being the first year in which the overall market share of LCC surpassed the overall market share of legacy carriers.*

[161] *This source of barrier to entry might not capture much attention in comparison to the high fixed costs needed to build a fleet, however, as shown by Snider and Williams (2015), the reduction of such costs can lead to sizable reductions in fares. In fact, in their study the authors show how the introduction in the year 2000 by the US Congress of the Aviation Investment and Reform Act (AIR-21), a regulation that imposed airports to increase the availability of facilities to new entrants, led to a reduction in fares up to 20% when both end points of a route were affected by the regulation.*

[162] *Low or negative returns on investments appear constantly in the yearly reports published by IATA in the beginning the 2000s. See for instance IATA (2010).*

on the demand for flying. Repeated years of low, or even negative profit margins led to severe financial distress within several airlines, which in turn triggered their exit or acquisition by other market players, or the decision to merge with other airlines. In the same 20 years, the consolidation wave that took place on both sides of the Atlantic was accompanied by a sustained growth in profitability,[163] with the only exception being the years following to the 2007 global financial crisis. In the US, the period between 2000 and 2015 saw the acquisition of Trans World Airlines by American in 2001, the establishment of a codeshare agreement between United and US Airways in 2003 and the inclusion, in the same year, of Delta in the same type of agreement previously signed between Continental and Northwest, the acquisition of US airways by America West in 2005, the merger between Northwest and Delta in 2008, the merger of United and Continental in 2010, the merger of Southwest and AirTran in 2011, and the merger between American and US Airways in 2013.[164] Thus, overall the airlines business is characterized by a good profitability, although it is clearly vulnerable to global shocks affecting the cost of fuel and the demand for long-distance transportation.

In the same decades, the European airlines experienced a similar financial situation, which led to tensions between EU Member States willing to support legacy carriers and the Commission, which has the goal to ensure that State aid does not distort competition. The EU markets also witnessed some important mergers which led to the formation of key groups. In 2004, Air France acquired KLM, creating the Air France KLM group. In 2010, Iberia and British Airways merged, creating the International Airline Group, which then acquired Vueling in 2012, Aer Lingus in 2015 and attempted, without finalizing, the acquisition of Norwegian in 2018. In 2003, finalizing the acquisition of Air Dolomiti, Lufthansa started the sequence of M&As that led to the expansion of the Lufthansa group. In 2006, Lufthansa completed the acquisition of Eurowings. In 2007 it acquired Swiss, in the following year it acquired Austrian Airlines, and 45% of Brussels Airlines, whose acquisition was completed in 2016. In 2009, Lufthansa acquired Germanwings, which continued its operations until 2020 when the process of internal restructuring and integration with Eurowings was completed. Finally, Lufthansa acquired several assets from Air Berlin after its bankruptcy in 2017. Overall, the European industry is characterised by the presence of several large players, such as Ryanair, Easyjet, Air France KLM, Turkish Airlines, the Lufthansa group, and the IAG group, which compete with medium size players, such as SAS or ITA, and with strong local players, such as Air Baltic and Aegean, thus making the EU industry more fragmented than the US counterpart.

Literature

Under specific assumptions on market conduct (i.e. the mode of competition between firms), economic theory delivers clear predictions on the relationship between prices and market structure, especially for industries characterized by important entry barriers, like in aviation where aircrafts are large and indivisible capital investments, safety standards are high and thus certifications require meeting such high standard. The firms

[163] *See for instance the aggregate statistics reported in the 2015 IATA annual review, available at*: *https://www.iata.org/contentassets/c81222d96c9a4e0bb4ff6ced0126f0bb/iata-annual-review-2015.pdf* and, more recently but still before the beginning of the COVID-19 pandemic (not considered in this report), see: https://www.iata.org/contentassets/c81222d96c9a4e0bb4ff6ced0126f0bb/iata-annual-review-2019.pdf. In the most recent, post-pandemic, series of communications, the IATA is again reporting positive results on profitability and a strong demand for flying worldwide (see https://www.iata.org/en/pressroom/2023-releases/2023-12-06-01/#:~:text=Outlook%20highlights%20include%3A,2.6%25%20net%20profit%20margin).

[164] *This list refers only to mergers or alliances that contemplate airlines accounting for more than 1% of domestic passengers.*

operating in such industries, which result in concentrated oligopolies, can exploit their market power, especially when other factors might facilitate the extraction of surplus from consumers, such as the possibility to price discriminate based, for instance, on time of purchase or the customer information that can be obtained from frequent flyer programs.

Empirical research showed that in the airline industry concentrated markets are characterized by market power. The bulk of the literature is based on the US markets, partly due to the early availability of granular data at the route level. Early contributions include Borenstein (1990), Borenstein and Rose (1994), Berry (1992), and Kim and Singal, (1993). These papers mainly focused on the effect of market concentration on market power, price levels, and price dispersion and some exploited sudden changes in market structure (mainly due to mergers between airlines) to estimate such relationships. More recent research has focused on estimating the competition game between firms and how incumbents can respond to the threats posed by potential entrants. Such contributions include Mazzeo (2002), Manuszak and Moul (2008), and, in the airline industry, Goolsbee et al. (2008), Ciliberto and Tamer (2009), Gerardi and Shapiro (2009), Ciliberto and Williams (2014), Zhang et al. (2017), Ethiraj and Zhou (2019), and Ciliberto et al. (2021).

The literature studying the airline industry has come to mixed conclusions regarding the relationship between market structure and price which are worth discussing, since most of such literature focused on consolidation as a (upward) shifter of market structure. From the early contribution of Borenstein (1990), several other papers have documented that prices tend to increase following a merger or, more broadly, a consolidation wave. This list of papers includes Kwoka and Shumilkina (2010) and Hüschelrath and Müller (2015).[165] However, two recent studies, Luo (2014) and Carlton et al. (2019) show mixed results of mergers on prices and an increase in quantity following the merger (i.e. an increase in the number of flights).[166] Price increases following a merger can take place also thanks to the fact that tacit collusion is made simpler (and can be sustained for longer), as documented in the case of airlines by Ciliberto and Williams (2014) and by Ciliberto et al. (2021).[167] A related strand of literature has examined how consolidation can affect other dimensions of competition that are relevant to consumer welfare, such as the quality of the service (see Steven et al. (2012)), or on the ability of firms to effectively price discriminate between consumers (see Stavins (2001)) and, related to price discrimination, the extent of price dispersion (see Gerardi & Shapiro (2009) and Gaggero & Piga (2011)).

Overall, the literature shows some consistent findings: firstly, the short run response of price to consolidation is sizable (and mostly upward), while later it is mitigated by entry of new players or an increase in the number of flights; secondly, the decision to merge indicates that airlines' management (and their stakeholders) consider it a profitable decision, either on the basis of an increase in market power, or on the basis of possible synergies. Thus, the resulting effects on prices and quality of service might vary depending on the case examined and estimating a causal, unbiased general relationship between market structure and price is challenging. Related to the last point on the

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[165] For a comprehensive ex-post evaluation where a large number of mergers have been studied, including mergers between airlines, see Kwoka J. E., (2012).

[166] For a list of published papers examining the price impact of mergers, see Table B.9 in the Annex.

[167] Also on collusion, but not in direct relation with consolidation, is the possibility of coordinating on quantity supplied (which is the case of airlines is the number of seats supplied on the routes) rather than price. In a recent study on airlines, Aryal et al. (2021) document that legacy airlines in US have been using earning calls to send information to competitors in order to restrict capacity on competitive routes.

mergers' motives, the specificities of each case, and the role of policy, an important contribution by Zhang et al. (2017) show that merger control (in the form of structural remedies) can be an effective tool to mitigate the downsides of mergers and benefit consumers.

2.4.2 Data and outcomes

The US markets between 2000 and 2019

In this section we present descriptive statistics of the US airline industry, to generate a benchmark for comparison to the European case. The data used throughout the section are obtained from the US Department of Transportation, which provides public access to data and statistics.[168] More specifically, the data we employ is the DB1B data, which collects ticket information for a representative sample including 10% of all tickets sold in the US market for a given quarter. For a detailed description of the procedure that we followed to prepare the data for the statistical analysis, see Annex B.3.

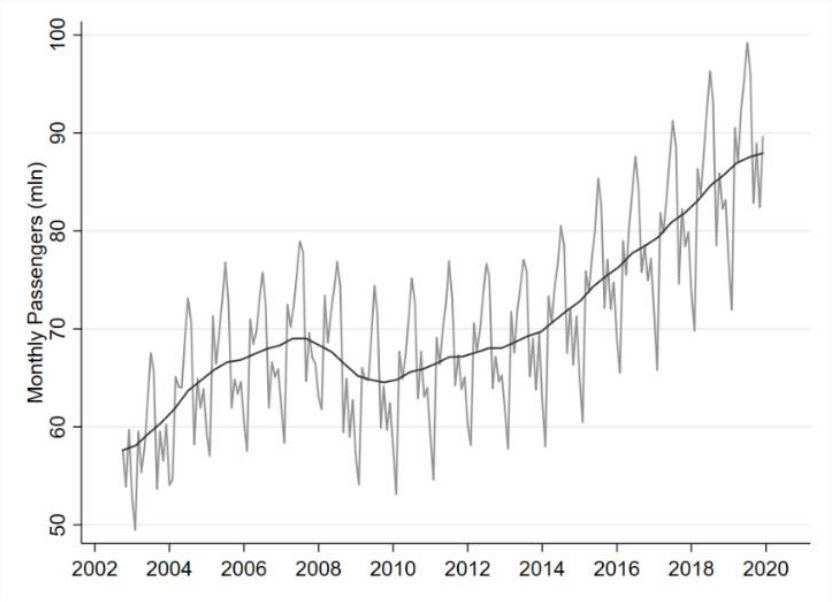
The DB1B data is the most used in the economic literature discussed in Section 2.1 due to the high level of granularity of the data. Each observation in the dataset is a single ticket, which means that it reports the origin and the destination (in the form of the airport codes), an indicator for the type of ticket distinguishing between one-way, round, or other possible cases, and the number of passengers. The data does not report the exact date of the flight, but instead it is organized at the quarter/year level.

Passengers

As shown in Figure 2.11, the US industry between the beginning of the 2000s and the beginning of the 2020s saw a general growth in the number of passengers with some reductions due to important events that had a large, but temporary, impact on the aviation industry and on the US economy.

[168] *See https://www.transtats.bts.gov/.*

Figure 2.11: Number of monthly passengers in millions including domestic and international flights



Source: Project Team based on data from the Bureau of Transportation statistics.

The first decade of the 2000s started with the terrorist attacks of 9/11, which caused a sizable drop in demand for flights which was fully recovered only in March 2004 when the number of monthly passengers went back to the level before 9/11. However, from the end of 2002, the upward trend was restored, and the number of passengers grew steadily until the 2007-08 financial crisis, which caused another reduction in volumes. From 2010 to the end of 2019, the growth in passengers has been sustained, reaching a level of almost 90 million per month at the end of 2019, and halted only due to the COVID-19 pandemic.

Concentration

The US markets, as discussed in section 2.2.1, underwent a consolidation wave throughout the 2000s and the first part of the 2010s, which is expected to have increased market concentration. Figure 2.12 shows the evolution of the HHI index at the aggregate (national) industry level from the first quarter of 2000s to the beginning of 2020 which indicates a strong increase in market concentration.[169] The index went from a value of approximately 1,100 at the beginning of the decade, a level that makes an industry still considered not concentrated, to almost 1,800 at the end of the following decade, a level that is close to moderate or high market concentration as per the latest 2023 US Merger Guidelines. Such an increase in the HHI is not surprising considering the consolidation wave described above, which reduced the number of airlines and brought together large market players.

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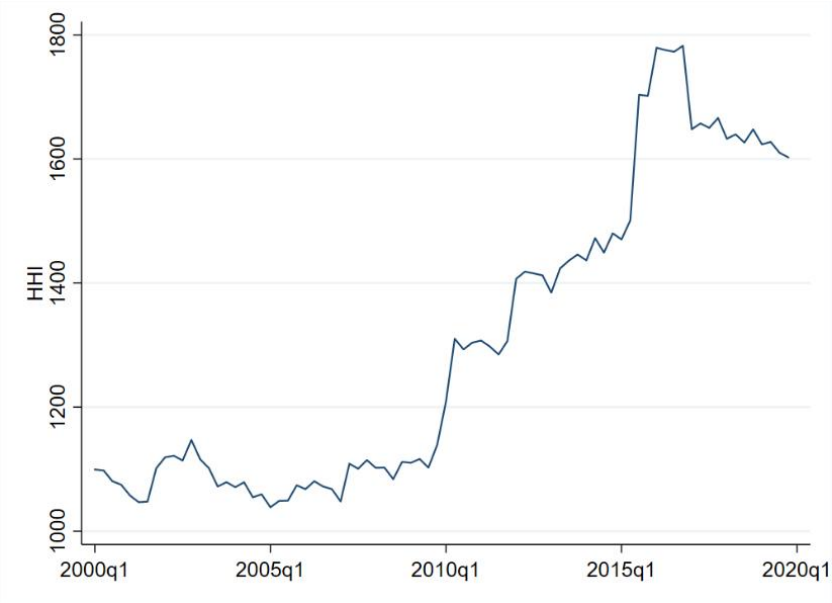
[169] *The standard and widely adopted measure of market concentration is the Herfindahl-Hirschman Index (HHI), calculated as:*

$$HHI = \sum_j s_j^2$$

Where s_j indicates the market share of firm j. For the industry-level HHI we use industry-level market shares, while for the market-level HHI we use market share at the route (i.e., the relevant antitrust market) level.

Figure 2.12: HHI of US aviation over time

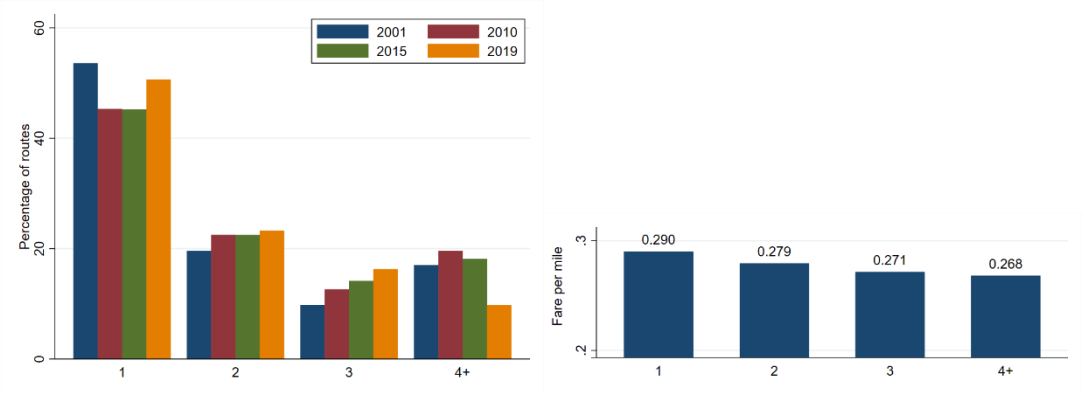


Source: Project Team based on data from the Bureau of Transportation statistics

Continuing with the analysis of the shifts in market concentration, the left panel of Figure 2.13 reports the share of routes with different market structures – monopoly, duopoly, triopoly, and routes served by 4 or more operators – for the years 2001, 2010, 2015, and 2019. After the difficulties experienced after 9/11 and the 2007-08 financial crisis, the number of routes operated decreased from almost 63,000 to 56,000 as many airlines rationalized their operations and focused on routes with a high number of passengers while leaving routes with a low number of passengers. This reduced the relative share of monopoly routes and increased the share of routes served by 2 or more firms, despite the consolidation wave having already started. In the second decade of the 2000s, instead, with a sustained and unhalted growth of passengers, the number of routes went back to almost 60,000. Notably, in terms of their composition, two things happened: firstly, the share of monopoly routes increased, due to the re-activation of routes with a relatively low number of passengers; secondly, the shares of duopoly and triopoly routes have also increased, with a decline in the share of more competitive routes, i.e., those with 4 or more players. This indicates that an important effect of the consolidation wave was to reduce the intensity of competition in "large" markets.

The right panel of Figure 2.13 reports the average price per mile travelled of the routes served by 1, 2, 3 and 4 or more airlines, showing a negative relationship between the average price paid by passengers and the number of different airlines providing the transportation service between origin and destination of the route.

Figure 2.13: Percentage of routes served by different number of airlines (left panel) and average fare per mile by number of airlines operating the route (right panel) in the US



Source: Project Team based on data from the Bureau of Transportation statistics

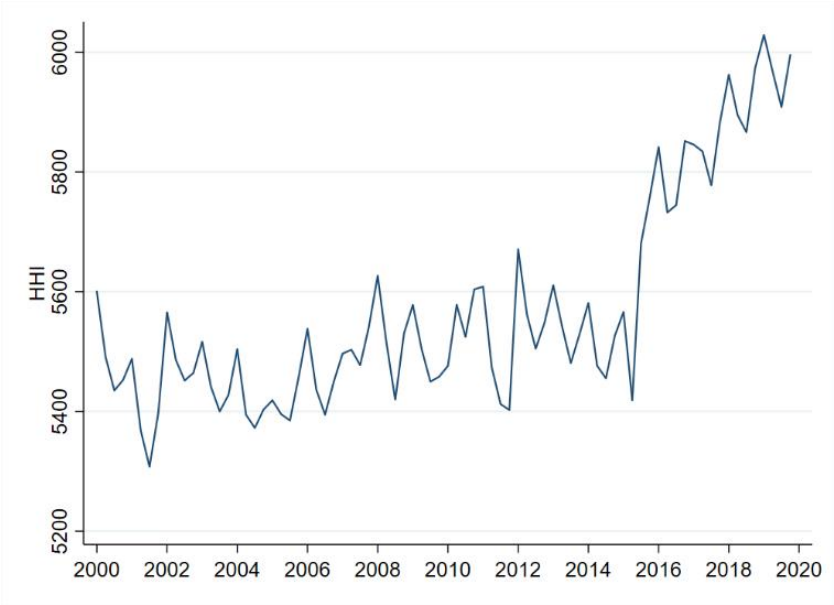
This analysis at the route level, which is the typical market definition in antirust cases,[170] highlights large differences in market structure and related market outcomes across markets. This makes it natural to also look at concentration at the market level, rather than at the national level as done above. In fact, if the commercial airline industry might result not particularly concentrated if we take a global perspective, it can instead be quite concentrated if we look at the concentration at the level of the route, which has been the market definition adopted by the EC.[171] Under this approach, we calculate for each route the standard HHI (based on the market shares of the airlines serving the route), and then average the route-level HHI across routes. In this case, as Figure 2.14 shows, the resulting HHI is much higher.[172]

[170] The EC in its decisions has often emphasized that routes are relevant to market definition. For example, in section 5 of the decision on the joint venture between KLM and Alitalia (Case M/JV-19 KLM-Alitalia), defines the relevant market as: "each point-of-origin / point-of-destination pair operated by either of the parties constitutes a relevant market".

[171] See case T-342/07 Ryanair v Commission EU:T:2010:280, par. 9..

[172] In this case the HHI is calculated, as mentioned in the paragraph, at the level of the route and then averaged using the total volume of the route (number of passengers) as weight.

Figure 2.14: Evolution of the average HHI in US at the route level

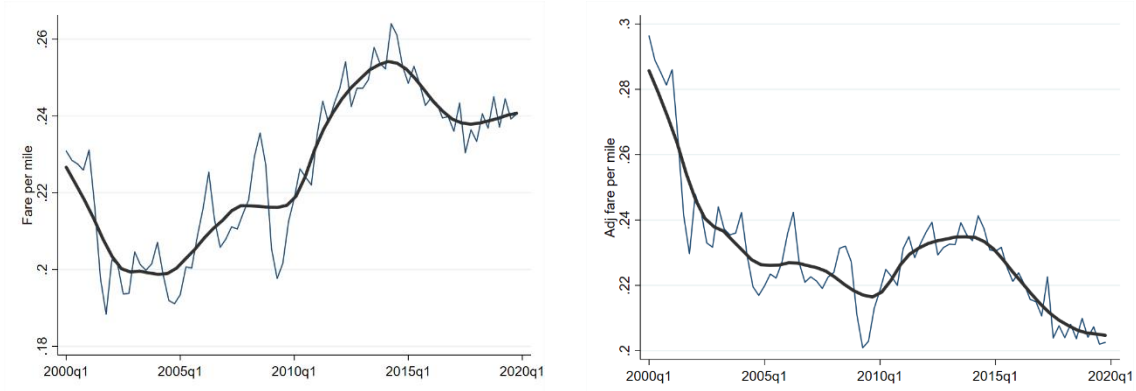


Source: Project Team based on data from the Bureau of Transportation statistics. The average HHI is calculated as a weighted average of the routes' HHI where the weight is given by the number of passengers traveling on the route.

Prices

The two panels in Figure 2.15 report the evolution of the price per mile travelled in nominal terms (left panel) and in 2010 Q1 dollar equivalent. The right panel indicates a moderate increase in the nominal price – approximately 10% in two decades – which is however a decrease in real terms once we adjust for inflation. This means that flying in the US continued its historical trend of being a more affordable service despite the rise in concentration.

Figure 2.15: Average fare per mile over time, in nominal terms (left panel) and in 2010Q1 dollars (right panel)



Source: Project Team based on data from the Bureau of Transportation statistics and US Bureau of Labor Statistics. The average price is calculated as a weighted average of the routes' price where the weight is given by the number of passengers traveling on the route.

The European markets between 2015 and 2019

The data employed for the analysis of the European markets has been provided by Cirium,[173] the data analytics division of FlightGlobal. The data covers all European routes in the period between January 2015 and December 2019 and it reports monthly information, at the airline-route level, on passengers, fares (both disaggregated between premium and economy classes) and on whether flights are operated under code-sharing agreements. Routes with very low traffic levels were excluded, as were airlines with very low traffic levels as a percentage of total traffic on a route. For a detailed description of the procedure that we followed to prepare the data for the statistical analysis, see Annex B.3.

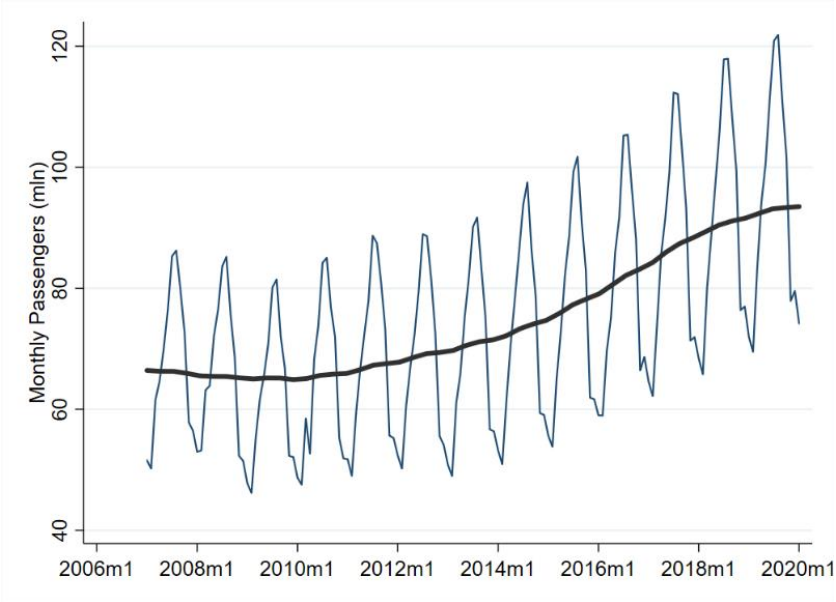
Airports and passengers

The European aviation industry counts almost 500 airports through which 100 million passengers per month fly to continental and intercontinental destinations. The average European airport serves a yearly average of 1.3 million passengers, although such figure is heavily affected by few large airports that manage a large volume of passengers and a relatively large number of small airports that have a low volume of activity. The number of passengers travelling in Europe saw a similar growth as the one experienced in the US. The 5 largest airlines in Europe (un-consolidated), based on the number of passengers, are: Ryanair, Easyjet, Lufthansa, Vueling and AirFrance. Table B.10 in the Annex reports the list of the list of the top-30 airlines in the time period covered in our data (2015-2019). In case an airline is not active in all months (such as in the case of Air Berlin) we consider for this average only the months in which the company operated.

As shown in Figure 2.16, passengers' growth dropped after the financial crisis, and remained low in the following years when the 2011-12 debt crisis developed in Europe. However, in the years from 2014 to the end of 2019, the number of passengers flying from and to EU27 countries grew substantially, going from a monthly average of 76.4 million in 2015 to a monthly average of 95.3 million in 2019, a 25% increase.

[173] *See https://www.cirium.com.*

Figure 2.16: Number of monthly passengers over time (in millions), including both domestic and international flights in EU27 countries

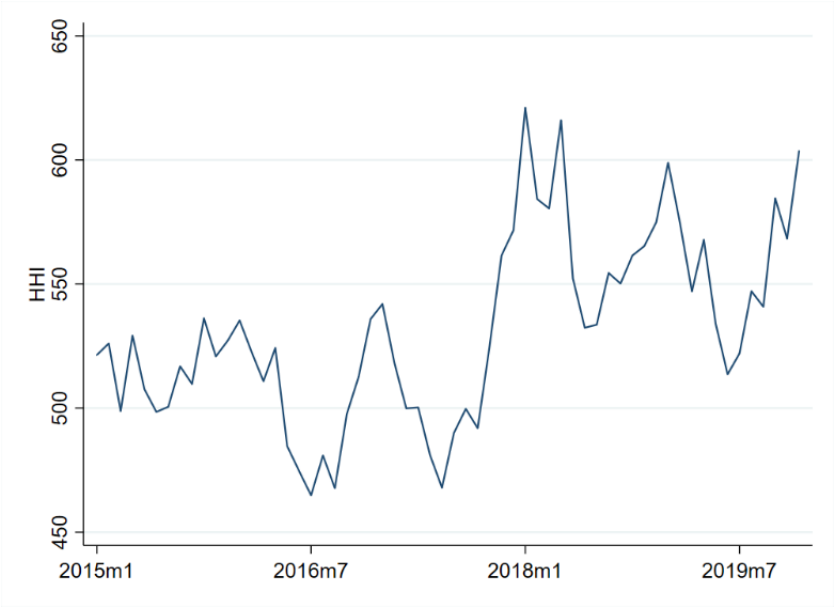


Source: Project Team based on Eurostat

Concentration

The European aviation industry is known as being fragmented, and the level of the HHI reported in Figure 2.17 confirms this expectation. The industry-level HHI is substantially below 1,000 points and increased slightly, from an average of approximately 520 points to an average of approximately 575 points in the second half of the sample – i.e., from 2018 onwards – most likely due to the acquisition of several Air Berlin's assets by Lufthansa after the bankruptcy of the former in late 2017.

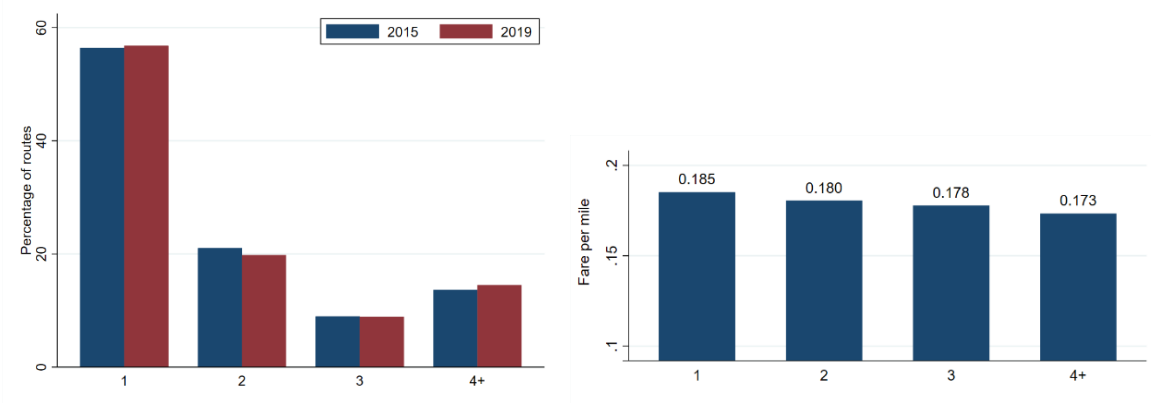
Figure 2.17: Evolution of EU airline industry HHI based on the number of passengers per carrier



Source: Project Team based on Cirium data

Moving to the relative frequencies in market structure, Figure 2.18 reports, similarly to the case of US discussed above, the relative frequency of routes served by 1, 2, 3, and 4 or more airlines. The changes in the frequencies of market structure are not large, also due to the limited number of years spanned by our data. Also, the relative frequencies in market structures pretty much aligns with those of the US market, which is particularly important to assess the actual market concentration and the competitiveness of the European airline market.

Figure 2.18: Percentage of routes served by different number of airlines (left panel) and average fare per mile by number of airlines operating the route (right panel) in the EU



Source: Project Team based on Cirium data

On the one hand, the HHI of the EU industry is lower than the one of the US industry. This is because European airlines typically have a regional focus within the EU (i.e., their share of the EU industry as a whole is small). On the other hand, when we look at the route level, we do not see highly unconcentrated markets, but rather similar frequencies of monopolies, duopolies and so forth as in the US. This can be particularly important for competition authorities assessing mergers that might involve relatively small players but that can bring together airlines directly competing in routes with a relatively small number of players.

The observation that the market structure is highly concentrated at the route level is confirmed if we compute the HHI index at the route level and not at the national level. In fact, if we first calculate the HHI at the level of the route-month, and then we average across the routes active in each month, the level of the index is much higher, as reported in Figure 2.19 below.[174] This finding is particularly relevant as, in contrast to the HHI calculated at the EU versus US level, it highlights that concentration in the EU is much higher – almost 1000 points – than in the US.

[174] *In the same way as we did for the corresponding HHI for the US market, we have calculated the HHI at the route level and then averaged using the total number of passengers of the route as weight.*

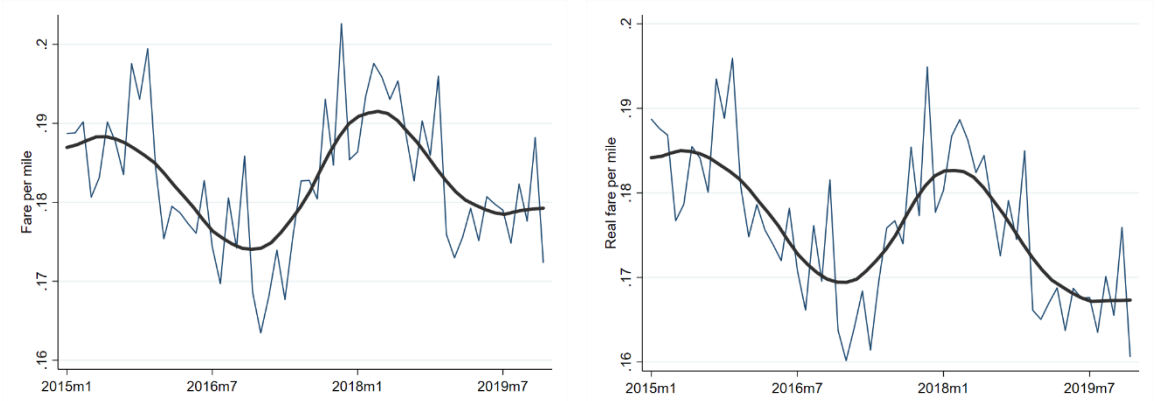
Figure 2.19: Evolution of average route HHI, based on the number of passengers served, and weighted by overall route passengers

Source: Project Team based on Cirium data. The average HHI is calculated as a weighted average of the routes' HHI where the weight is given by the number of passengers traveling on the route.

Price

In Figure 2.20 we report the average monthly price paid by travellers in EU, both in nominal terms (left panel) and adjusting for inflation using the CPI (right panel). Because the nominal price oscillates around an average of approximately 0.183 euro per mile, the price in real term is reducing in the five years considered, a similar pattern to what we have reported for the US markets.

Figure 2.20: Average fare per mile over time in euro, unadjusted (left panel) and deflated using CPI (right panel)



Source: Project Team based on Cirium and Eurostat data. The average price is calculated as a weighted average of the routes' price where the weight is given by the number of passengers traveling on the route.

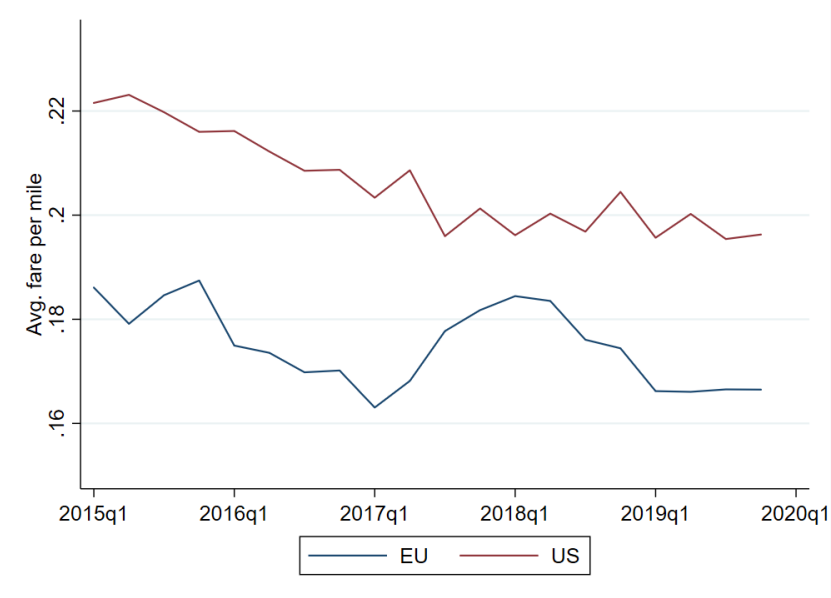
Comparison of the fare per mile in EU and US

In previous sections, the EU and US markets have been presented separately. Here instead we compare an important market outcome that is relevant for consumers: the

average fare per mile. In order to do so, we restrict the time window to the period between 2015 and 2019, and we convert prices by expressing them in 2015 euros.[175]

It has been often observed that the average fare per mile in the US is higher than in EU[176] Our data confirm this claim, as shown in Figure 2.21, which report the average (passenger weighted) fare per mile in the two markets between 2015 and 2019.

Figure 2.21: Average fare per mile in EU and US (expressed in 2015 euros)



Source: Project Team based on Cirium data and data from the Bureau of Transportation statistics. The average fares per mile are weighted using the number of passengers and expressed in 2015 euros.

The difference in the average fares per mile at the beginning of 2015 amounts to 3.6 cents, which reduces to 3 cents at the end of 2019. This sizable price difference (which amounts to approximately 19 percent on average throughout the sample), although decreasing over the 5-year period, seems to stabilize after 2017, when the decline in the US fare per mile halted.

The driving factors for this difference can be broadly divided into two groups: those related to the type of product that consumers demand (and their willingness to pay for it), and those related to the supply of the service, and in particular to competition between airlines. Starting from the former group of factors, due to geography, long distance commuting patterns, and the availability of alternative means of transportation, US consumers travel a substantially longer distance than EU consumers. On average, an EU route is 670 miles long (which takes approximately 1 hour and 50 minutes, including take-off and landing), while an US route is 1118 miles long (which takes approximately 2 hours 40 minutes, including take-off and landing). This difference in flight time is probably an important factor that explains the larger importance of legacy carriers versus LLCs that we still observe between the two markets. In fact, the

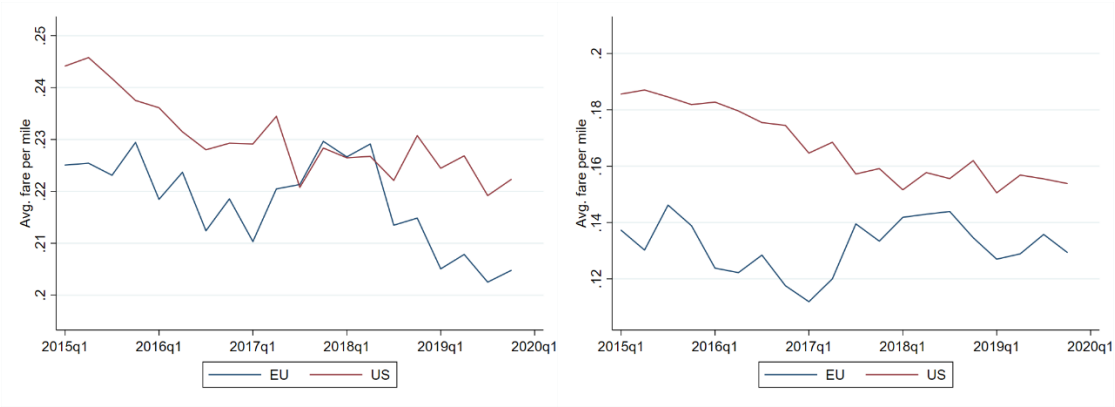
[175] *For the US prices we do so by first expressing US prices in terms 2015 dollars, and then converting them into Euros using the average exchange rate of the period 2015-2019.*

[176] *See for instance: https://www.theglobalist.com/why-airfares-in-europe-are-lower-than-in-the-u-s/ or, more recently, https://www.washingtonpost.com/news/worldviews/wp/2017/10/12/why-are-flights-so-much-cheaper-in-europe-than-in-the-u-s/ .*

European market sees LLCs serving 50.5% of passengers against 38.39% in the US, and the EU top-5 list of airlines by volume includes 3 LCCs, ranked 1st, 2nd, and 4th.

The observations made in the previous paragraph indicate that the average difference in the fare originates, at least partly, from a different type of service bought by consumers, and suggest to compare the fare per mile of legacy airlines and LCCs separately, which are reported in Figure 2.22.

Figure 2.22: Average fare per mile in EU and US of legacy airlines (left panel) and LCCs (right panel), expressed in 2015 euros.



Source: Project Team based on Cirium data and data from the Bureau of Transportation statistics. The average fares per mile are weighted using the number of passengers and expressed in 2015 euros. The left panel reports the average fare per mile in EU and US of legacy airlines while the right panel reports the average fare per mile in EU and US of LCCs.

The figure shows that the gap in price is much larger (both in absolute and in relative terms) for LCCs than for legacy airlines, but the former see the gap reducing over time. The price gap between US and EU legacy airlines at the beginning of 2015 is 1.9 cents and it is 1.7 cents at the end of 2019, corresponding to 8.1 percent and 7.9 percent respectively. The price gap between US and EU LCCs at the beginning of 2015 is 4.9 cents and it is 2.5 cents at the end of 2019, corresponding to 30.3 percent and 17.6 percent respectively.

From this analysis, we can conclude that, in particular for LCCs, the US airlines offer to their passengers a service at a higher price than EU airlines. As mentioned above, this can be due to demand-side and supply-side factors, and to their interaction. Although our data do not allow us to disentangle the contribution of each factor to the price difference that we document, we could hypothesise that the European markets, despite the first LCCs having been started in the US, provides better conditions for their growth – a lower average route length – which makes consumer both more willing to accept a lower quality service[177] and more price sensitive. Potentially, this may have helped EU's LCCs to enter the market faster, and to price their service more aggressively, which in turn could have led legacy airlines to reduce their price.[178]

[177] *Measuring quality is challenging as data has obvious limitations. However, data on seat pitch (i.e. the distance between seats) shows that US airlines offer on average 2 inches (or 5 centimeters) more legroom, and more frequently services such as TVs and food.*

[178] *For a paper consistent with this mechanism, see Kim et al. (2021).*

Remarks on the descriptive analysis

The descriptive analysis of the US and EU airline markets shows that both have experienced similar dynamics and are comparable in many respects. Focusing on the aspect of market concentration, while they both have a relatively low HHI when we consider the national (aggregate) industry-level shares of supply of airlines, the analysis at the route level shows that a substantial share of routes is served by only 1 or 2 carriers. These two facts indicate that on the one hand the industry is still quite fragmented, but on the other hand it is also compatible with the strategic decision of airlines to avoid direct competition for passengers travelling on the same route.

Before moving to the econometric analysis, it is important to emphasize a difference between the US and EU industries that emerges from the descriptive analysis – besides the role of LCCs versus legacy airlines discussed in the previous section – and it is related to the intensity of competition at the local level (which in our case is the route). While on the one hand the US airline industry results to be more concentrated when we look at the very aggregate level of the industry (the *aggregate* HHI in the US is 1,700 at the end of 2019 while it is only 600 in EU), on the other hand the EU market is more concentrated when we look at the local level, i.e. the route level (the *local* HHI is approximately 6,000 at the end of the sample in the US while it is 6,500 in the EU). This is because while in the US airlines tend to be relatively fewer and larger in size (partly as a result of the mergers that we mentioned in section 2.4.1) they are also more likely to compete for passengers at the route level, and thus the US airline industry displays a lower level of concentration at the route level. The EU industry instead is relatively fragmented when we look at it from an aggregate perspective (also due to the role that national champions played historically, and countries' reluctance to allow takeovers of national champions from foreign companies), but it displays a higher level of concentration at the route level, as airlines are less likely to compete with each other at the route level.[179] In other words, the EU landscape is populated by relatively more regional players that face less competition.

Based on the considerations in the previous paragraph, we calculated an intermediate measure of HHI that can better reflect the market conditions that travellers face in the EU. Because routes are substitutable to some degree (for example, a consumer who needs to fly to Brussels can consider also nearby airports such as Charleroi), we calculated the HHI at the EU-NUTS2 region level.[180] In this case the HHI is, as expected considering that many airlines target one or only few airports in a region,[181] in between the industry level HHI and the route level HHI, and amounting to 2700, and stable

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[179] *A situation as the one described can be easily understood with a simple example. Consider the case of two economies, each with an oligopoly with identical firms. The first economy has 2 firms (so it's a duopoly) and the second has 3 firms (so it's a triopoly). In each economy there is a number of local markets in which firms can sell their products or not (i.e. the equivalent of the routes for airlines), for example 3 local markets in each economy. Then, it is then easy to think about situations in which although the first economy has only 2 firms and so a higher HHI at the aggregate level, the second economy has a higher HHI at the local level. An extreme example would be the case in which every local market in the first economy has both firms competing while the every local market in the second economy has a monopolist. In this case, the first economy would have an "aggregate" HHI of 5000 and a "local" HHI of 5000, while the second economy would have an "aggregate" HHI of 3267 but a "local" HHI of 10000. Thus, in the context of this example, the US markets resembles more the first economy while the EU market resembles the second economy.*

[180] *NUTS2 is a standard EU territorial unit usually populated by between 800,000 and 3,000,000 inhabitants, although densely populated NUTS-2 regions can have a much larger population. For example, in Germany NUTS2 are single the Federal State (e.g., Bavaria), while in Italy are the regions (e.g., Lombardy).*

[181] *This applies both to legacy airports, which tend to target the main airport of a region and to low-cost carriers, which instead have, as part of their business model, to concentrate operations in a secondary airport usually located relatively farther from the core metropolitan area of the region.*

throughout the sample period covered by our data. This level of HHI could raise the attention of regulators if new merger proposals are made, especially if they involve airlines that are directly competing in most of their routes.

Finally, the descriptive evidence also shows that the price paid by passengers continues to follow its long-term negative trend (an element that contributed to the steady increase of volume of air transportation).

Econometric analysis

The econometric analysis of the relationship between price and market structure exploits the heterogeneity in market structure across routes to estimate its effect on the price paid by passengers, controlling for other factors influencing price.

The analysis is divided in two parts. In the first part, we follow a more *descriptive* approach by relating price and market structure within a regression framework in which we control for factors influencing price such as the cost of fuel or the share of premium-service tickets sold by companies operating the route. In some specifications, we also account for time-invariant route effects which account for important price drivers such as the popularity of some routes. This analysis provides conditional correlations between prices and market structure. In the second part of the analysis, we pursue a different empirical strategy that aims at quantifying a *causal* relationship between the two main variables of interest. This empirical approach exploits an event that exogenously affected the market structure in many routes across the continent: the bankruptcy of Air Berlin and the acquisition of several of its assets by Lufthansa.

The econometric model that we estimate in the first part of the analysis is a panel regression where the unit of observation is the route observed in a certain time (quarterly in the case of US and monthly in the case of EU). The main dependent variable is the fare per mile, measured in the domestic currency, while the explanatory variables are, depending on the model, demographic information on the areas where the origin and destination airports are located, the cost of fuel, the relevance of low-cost carriers (measured as the total number of passengers served), and, importantly, the number of airlines operating in the route. In some specifications (the most preferred), we drop all explanatory variables that are constant over time as we introduce in the model a set of route fixed-effects.[182] Results of the estimation are reported in Table 2.6 where column (1) reports the estimates of the model for the EU market while column (2) reports the estimates of the model for the US market.

Results clearly indicate that a lower number of airlines is associated with a higher price per mile travelled in domestic currency. To better interpret the estimated coefficients of the regressors related to the market structure (the indicators for the monopoly, duopoly and triopoly), we also report in square brackets the percentage effect on the price per mile. The estimated coefficients imply that, compared to the baseline market structure of 4 or more competitors, the fare per mile in a monopolized route is, *ceteris paribus*, 5.6% and 5.9% higher in the EU and in the US respectively. In the case of a duopoly, also in comparison to the baseline of 4 or more competitors, the fare per mile is 2.6% higher in EU and 3.6%higher in the US, while in the case of a triopoly the fare per mile is 0.9% higher in the EU and 0.6% higher in the US. Lastly, we notice the impact on price of having a stronger presence of LCC, which is negative and highly statistically significant.

[182] *For instance, population size in the European data is not measured in every month but is instead taken from Census statistics, and thus is dropped from the regression when we introduce route fixed-effects.*

Table 2.6: Regression model for the fare per mile

Dependent variable: price per mile		
	EU markets	**US markets**
	(1)	(2)
Monopoly	0.0082***	0.0164***
	(0.0003)	(0.0008)
	[+5.5%]	[+5.9%]
Duopoly	0.0039***	0.0100***
	(0.0003)	(0.0005)
	[+2.6%]	[+3.6%]
Triopoly	0.0014***	0.0017***
	(0.0003)	(0.0004)
	[+0.9%]	[+0.6%]
LCC Share	-0.0256***	-0.1268***
	(0.0004)	(0.0011)
Dep. Var. mean	0.1493	0.2777
Route FEs	Yes	Yes
Period FEs	Yes	Yes
R^2	0.893	0.949
Observations	474,559	296,744

Notes: The table reports the estimated coefficients of a panel regression for the fare per mile. The dependent variable in columns (1) is the fare per mile in EU measured in Euro, while the dependent variable in columns (2) is the fare per mile in US measured in US dollars. The list of explanatory variables include a set of indicator variables for the market structure: Monopoly, Duopoly, Triopoly which take value 1 if the route is served by 1, 2, or 3 airlines respectively. We model trends and seasonality by including period fixed-effects (from 1 increasing until the end of sample, labelled Period Fes). We also include Route fixed effects, to capture all factors, observed and unobserved, that pertain to the route and do not vary in the time period considered (Route Fes). For the regressors related to the market structure we report the percentage effect in square brackets. Source: Project team based on data from Cirium, Eurostat, the Bureau of Transportation statistics, US Census, Federal Reserve Economic Data (FRED)

The second part of the econometric analysis exploits the exit of an important European airline, Air Berlin, which took place in 2017, and whose fleet and slots have been for a large part acquired by Lufthansa. The exact moment of the realization of this event was unexpected, although some rumours surrounding the financial situation of the company started to spread much before the actual bankruptcy. This provides an ideal setting to estimate the effect on price following a sudden change in the number of market players, which is quasi-exogenous to the market outcome of the remaining airlines at the route level. The analysis, which takes the form of an *event study*, consists in comparing the

very same route, before and after the event, thus holding everything constant (at least in the short run), but for the number of airlines.[183]

The empirical approach just highlighted hinges on the fact that the bankruptcy of Air Berlin affected a non-negligible number of routes, thus generating a sufficient number of statistical units to be employed in the analysis.[184] In this respect, the case of Air Berlin seems to be well suited for our purpose. In fact, the company served as operating airline (i.e., the airline that actually flies between the origin and the destination airport) in almost 600 routes.[185] Furthermore, such routes spanned well the spectrum of different market structures, as reported in Table 2.7.

Table 2.7: Distribution of routes affected by Air Berlin's exit by number of competitors

Number of airlines (including Air Berlin)	*Number of routes*	*Perc.*
1	170	28.48
2	132	22.11
3	126	21.11
4+	169	28.3
Total	**597**	**100**

Source: Project Team based on Cirium data

As the table shows, 170 routes were served by Air Berlin as a monopolist the year before its bankruptcy, corresponding to 28.5% of the total routes served by the company.

Figure 2.23 confirms that the exit of Air Berlin had important consequences on the routes in which the carrier was operating until the beginning of the summer 2017. Firstly, the left panel of the figure shows the average number of airlines before and after the exit of Air Berlin from the market. This number was increasing in the months before exit, reaching a level of approximately 2.7 carriers in July 2017, but it dropped abruptly after the bankruptcy to approximately 1.6 and remained around that level until the end of our sample in December 2019.[186] We notice here once again the importance of entry barriers in the context of the airline industry. As discussed previously, the entry costs to set up an airline are important, as they imply to hire highly specialized staff, making

[183] *Considering that the financial struggles of Air Berlin where known to the rest of the competition, and this could have triggered some actions when the exit was on sight, we exclude from the analysis the 2 months before the exit and the month following the exit.*

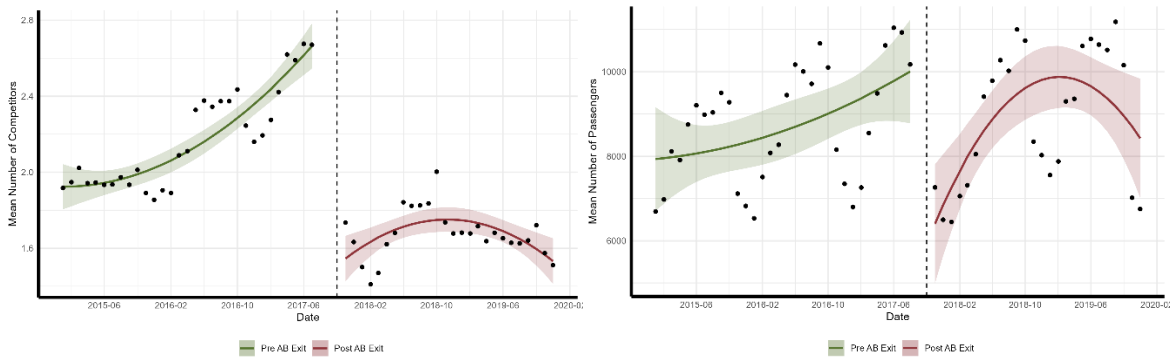
[184] *Moreover, each treated route (i.e., each route that was served by Air Berlin), is going to be matched with one control route or more, depending on the number of routes that can be considered a good match.*

[185] *Air Berlin at its peak was the 8th European airline totaling more than 51 million tickets sold per year. It served mainly routes with an endpoint in Germany (64% of the flights had either their origin or destination in Germany) but nevertheless it had an important presence in Europe as almost 200 flights out of 600 (roughly 32%) had either origin or destination outside Germany and where thus competing with the other European Airlines.*

[186] *All graphs from Figure 2.23 to Figure 2.25 report the average of the variable after having removed the effect of seasonality, route characteristics and other factors through a regression that is the same as in the panel regression analysis, but for the inclusion of the variables related to the market structure.*

large investments in physical capital, and meeting the high safety standards that operating in this industry requires. Besides these factors, the observation that one year after the exit of Air Berlin the number of airlines operating in the routes where Air Berlin was active is still lower by approximately one airline shows that the cost to expand to new routes (which requires re-deploying the existing fleet or buying/renting new aircraft, obtaining airport slots etc.) are sizable and can discourage entry even if the fare per mile (due to higher concentration) has increased.

Figure 2.23: Number of airlines (left panel) and average number of passengers (right panel) in Air Berlin routes before (green) and after (red) Air Berlin's exit



Source: Project Team based on Cirium data.

Secondly, the right panel of the figure reports the average number of passengers served in the same routes. Interestingly, passengers were also increasing in the months before the exit of Air Berlin, then they suddenly decreased – most likely due to the change in prices that we will document below or the change in offerings – and only after some months went back to pre-exit levels. This also indicates that, absent entry of new carriers to replace Air Berlin (shown in the graph on the left), the passengers that were not served anymore by the bankrupt company have been served by the other airlines active in the routes, either by fitting more passengers on the same number of flights that were scheduled before exit, or by increasing the number of monthly flights operating in these routes.[187]

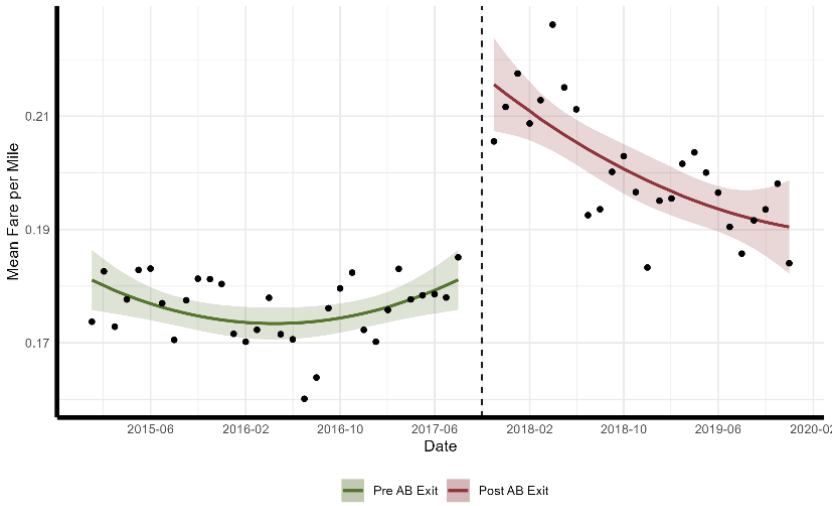
Summarizing the evidence so far, the routes interested by the exit of Air Berlin saw an average decrease of approximately 1 operator in the number of carriers, signalling that at least for more than one year after the event, the missing airline was not replaced by a new entrant, and the number of passengers, after a sudden drop, slowly recovered to reach levels comparable to those before exit.

The impact of the exit on price is reported Figure 2.24. The average fare per mile paid by passengers travelling on the routes that were served by Air Berlin was fairly stable around 0.18 euro. However, after the exit of Air Berlin it suddenly increase to 0.215 euro (an increase of 19.4%) and remained above 0.19 cents throughout the following year, despite the volumes of passengers flying went back to the pre-exit levels rather quickly. On average, the price paid by passengers between Air Berlin's exit in October 2017 and the end of 2019 has been approximately 0.2 euro, i.e. 11% more than the average price before the exit. This shift reflects the change in the competitive

[187] *Our data do not allow us to disentangle between the two alternatives as they report only the total number of monthly passengers per carrier/route and not the number of flights.*

environment in these routes, where the average number of airlines competing for passengers decreased due to the exit of the German airline.

Figure 2.24: Average fare per mile in the routes served by Air Berlin before (green) and after (red) its exit



Source: Project Team based on Cirium data

The results just reported are confirmed if, instead of pooling all Air Berlin routes, we split the sample based on the market structure before the exit of the airline. We thus divide the routes in two groups: the routes that before the exit of Air Berlin had on average 3 or less competitors, and the routes that before the exit of Air Berlin had on average more than 3 competitors.[188]

In the two panels of Figure 2.25 we report the event study graphs for the sample of more concentrated routes (upper panel), and the less concentrated routes (lower panel).[189] First of all, we notice that the effect of the exit is present both in more and in less concentrated markets. Secondly, the two graphs show that the more concentrated markets have a higher fare per mile already at the baseline, approximately 19 cents per mile in the former and 16.5 cents per mile in the latter. Thirdly, with the exit of Air Berlin, the short run response of the fare per mile is remarkable, as it displays a sizable jump in both types of markets: in the more concentrated routes, the average fare per mile increases by 4 cents, a sizable increase of more than 21% while in the less concentrated markets the average fare per mile increases by 2.4 cents, i.e. a 14.5%.[190] Looking at a longer time window after the event, this strong response of prices to the exit of Air Berlin is reduced for both types of markets. The more concentrated markets still have a higher fare per mile of approximately 1 cent, while the less concentrated

[188] *The total number of routes that were served by Air Berlin, as reported in Table 2.7, is approximately 600. This implies a trade-off between sample size (and thus precision of the estimated effects) and the goal of estimating the effect of the exit for different levels of competition. We thus opted for a split in two groups with a threshold of 3 competitors as it aligns with the results of the panel regression and implies reasonable sample sizes for the estimation of the effect through an event study approach.*

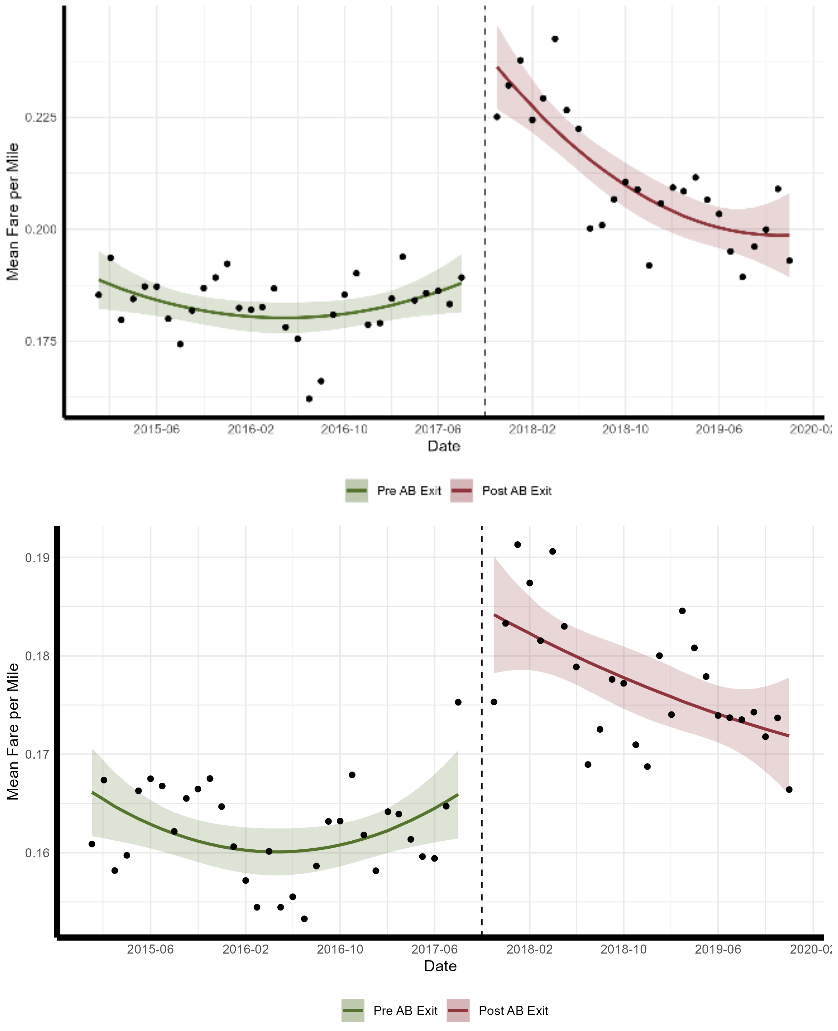
[189] *The other graphs on the number of competitors, and the number of passengers are reported in the Annex.*

[190] *The average increase of 19.4% that is obtained pooling all markets is the result of the changes in these two groups of markets, with the less competitive markets experiencing a greater price increase.*

markets have a higher fare per mile of 0.5 cents, corresponding to a 5% increase and a 3% increase respectively.

Notably, the estimated effects that we obtain with the event study when we consider price levels at the end of the time window (i.e. once market actors had enough time to adjust for instance offering more flights or deploying larger aircrafts) are remarkably close to the estimates that we obtain with the panel regression in Table 2.6. This is not so surprising if we consider that such regression model can still be subject to some endogeneity bias, which is going to affect the estimated relationship between market structure and price. The reason for this bias lies in the fact that market structure cannot be considered as fully exogenous, even after controlling for a sensible (and possibly long) list of market characteristics. This has two important implications when conclusions are taken from a study that cannot rely on some form of robust identification: firstly, it is important to assess the *quality* of the empirical analysis, which is often constraint by the data available to the analyst; secondly, it is important to assess the direction of the bias that is likely to affect the estimated relationships between the variables.

Figure 2.25: Average fare per mile in the routes served by Air Berlin with up to 3 competitors (upper panel), and in the routes served by Air Berlin with more than 3 competitors (lower panel) before (green) and after (red) its exit.



Source: Project Team based on Cirium data.

2.4.3 Conclusions

In this section we have analysed the state of competition in the passenger airline industry in the EU, also comparing it to the US. The industry, at the aggregate level, displays relatively low levels of concentration, due to the large number of companies active which, although often linked through alliances, are not formally integrated in the same group. However, this industry presents the peculiar aspect that it is divided in a large number of relevant markets (routes) with limited cross-substitutability, and that present relatively high levels of concentration.

The empirical analysis shows that, in line with the literature, market structure has a strong impact on prices, which we find to be substantially higher in markets that are more concentrated. This finding is confirmed both by a panel regression analysis on a comprehensive dataset of European as well as US routes, and by an event study that exploits the plausibly exogenous exit of a prominent European airline to identify the causal impact of market concentration on prices.

We conclude with a *back-of-envelope* calculation of the potential gains for the consumers from a more competitive landscape in the airline industry. The exercise consists in increasing the level of competition in all markets that are relatively concentrated – i.e. monopoly routes, duopoly routes, and triopoly routes – by 1 operator, and calculating, holding everything else constant, the savings that passengers would enjoy thanks to a lower price per mile travelled.[191] For the calculation we employ the estimated coefficients in the regression model reported in column (1) of Table 2.6, and for each route in EU we calculate the amount of euros saved by passengers from moving one level up in the number of airlines. For the whole European market, the total that we obtain is 898 million euro per year.

2.5 Beer

Beer is one of the most popular drinks in the world.[192] Despite its popularity among consumers, there are still significant price differences between EU Member states, along with country-specific variation in market structure and, in particular, concentration.

This section conducts a price-concentration study on the European market for beer. A general industry background and the relevant literature are first discussed. A specific exploration is then conducted for the beer markets in five European countries: Belgium, Czech Republic, France, Germany and Italy. These countries exhibit heterogeneity in prices, with Germany having a substantially lower price than many others. A closer analysis of the German case reveals that competition may have been playing a role in keeping German prices down. The section concludes by presenting an illustrative estimation of potential gains that Member States could obtain by moving from their current level of price to that of the lowest price Member State studied.

2.5.1 Industry background and literature

Beer is an alcoholic beverage derived from malted grain and brewed with hops and yeast. The most common beer types are lager, ale and stout, which are produced

[191] *This exercise comes with its own limitations. Firstly, we keep the total number of passengers constant despite the fact that a lower price would induce more people to travel, Secondly, we do not consider that having 1 more airline active in each route would increase substantially the costs to operate flights, both for the companies and for airports, thus partly offsetting the price reduction due to stronger competition. Finally, a full welfare analysis, would also imply to consider other elements, such as the increased environmental costs that the higher number of passengers would produce.*

[192] *https://time.com/5407072/why-beer-is-most-popular-drink-world/*

through different recipes. The major difference between types of beer comes down to the type of yeast used to ferment it. Ales are created through top fermentation, a process in which yeast ferments at warmer temperatures and settles at the top of the beer. Yeast used to make lager tends to settle at the bottom of the beer, and the fermenting process is longer and takes place at cooler temperatures. The yeast in ales has a higher tolerance for alcohol than the yeast used in lagers.[193] The most sold type of beer is lager, with a share of sales of around 89% all around the world in 2016 (Madsen and Wu, 2014). In a merger case from 2016,[194] the European Commission states that it is possible to further "distinguish beer based on parameters such as price, brand recognition, and quality between value or discount beer (private label and entry level lager brands), mainstream beer (most popular lager brands), premium beer (national and international upmarket lager brands), and super-premium beer (specialty beers, beer mixes, international brands in the highest price and quality range)".

There are two main channels of beer distribution: off-trade and on-trade. The off-trade channel comprises the beer sold in the retail outlets and grocery stores. The on-trade channel comprises the beer sold to be consumed at the time of the purchase, such as beers in pubs and restaurants. The perceived quality of the beer available to the consumer can also vary significantly between channels. While on-trade channels typically offer premium beers to their customers, grocery stores tend to offer the most common lager beers. Customer preferences can vary between the two channels, too.

Competition in beer markets occurs largely at a national level due to three main reasons:[195] (i) there are differences in consumption habits across countries - for example, mainstream beer is more popular in some countries (e.g., Romania), whereas in other countries such as France, premium beer is more popular; in some cases, consumers have a stronger preference for stout or lager beer. Consumers preferences between national and international brands can also differ between countries; (ii) the distribution networks are generally organised at national level; and (iii) there are differences in terms of legislation across countries. This is reflected by market structures (and concentration levels), as they tend to be relatively stable within countries, with substantial differences between them.

The beer industry is characterised by significant entry and expansion barriers due to three main reasons.[196] First, the high relevance of brand recognition in national markets, resulting in high costs and long lead times for the development of new brands. Second, the high cost of investment in production facilities and the associated economies of scale. Finally, access to distribution networks is difficult due to the limited capacity faced by distributors (e.g., shelf space) as well as the existing contractual obligations to incumbents. Large scale de novo entry has been atypical as a result.

Additionally, customers (e.g., bars and restaurants or supermarkets) tend to have limited bargaining power and, therefore, very low ability to constrain beer suppliers. This is particularly true in the on-trade market, which helps explain why brewers' margins are typically higher in this channel.[197]

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[193] *See https://time.com/5218581/types-of-beer-guide/.*

[194] *Case COMP/M.7881 - AB InBev/SABMiller of 24/05/2016, par. 24.*

[195] *See case COMP/M.7881 - AB InBev/SABMiller of 24/05/2016, par. 33-35.*

[196] *See case COMP/M.7881 - AB InBev/SABMiller of 24/05/2016, p.10.*

[197] *Case COMP/M.7881 - AB InBev/SABMiller of 24/05/2016.*

Marketing and advertising seem to play in important role for competition in this industry as they are fundamental tools for gathering consumers' attention. For example, looking at the 2022 Annual Reports from three of the main beer companies active in Europe (ABinBev, Heineken, and Carlsberg), marketing and selling expenses represent, on average, between 7% and 12% of total revenues. According to Madsen and Wu (2014), the beer industry has one of the highest expenditures on marketing and sales promotion, ranking above the fast-food and sportswear industries. One of the reasons that might explain this level of investment in advertising is that, in blind tests, consumers seem not to perceive significant differences in taste within the same categories of beers (Madsen and Wu, 2014). Hence, companies are using advertising as a strategy to differentiate themselves and to attract consumers.

Overall, market concentration in the beer industry has increased substantially in Europe from 1950 onwards with the development of new production technologies and the decrease in transport costs, which have led to economies of scale for large producers (Ascher, 2012; Natsuko et al. 2008; Poelmans and Swinnen, 2011). Madsen (2019) reports that the top 4 beer companies have almost 60% of the global market share in terms of volume.

However, there seems to be no full consensus on concentration's impact on the main market outcomes. On the one hand, given the role of economies of scale, higher concentration can lead to lower marginal costs and, therefore, create scope for beer producers to lower prices. On the other hand, higher concentration can underlie higher market power, which in turn can lead to higher prices.

Much of the empirical evidence on the impact of changes market structure on market outcomes is provided by ex-post assessments of mergers in the U.S. Ashenfelter et al. (2015) finds that the 2008 U.S. merger between Miller and Coors has led to an increase in prices in the short run but not in the long run. Specifically, two years after the merger, the average price of beer in the U.S. has returned to its initial value before the merger. However, Miller and Weinberg (2017) reported a significant increase in the prices charged by two leading competitors in the U.S. brewery industry, Miller and Coors and Anheuser-Busch InBev, following the 2008 Miller and Coors merger. Madsen (2019) states that the increase in cross-border acquisitions and mergers between 2000 and 2016 have led to an increase in global ownership and global market power, two of the factors that might explain the 26% increase in premium lager beers' price internationally. Pinske and Slade (2004) suggest that a beer company merger in the UK which had been proposed but was not consummated would have resulted in a 3% price increase. While the above literature suggests that larger market concentration can lead to higher prices, there is evidence that it may also foster the entry of new firms in a different industry segment. In particular, Azar and Barriola (2022) shows that the increase in the commercial brewer market concentration following the 2008 merger between Miller and Coors in the US was followed by an increase in the number of craft brewers between 2008 and 2011. This effect, however, may not be sufficient to counteract any harmful price effects in the origin segment.

Without attempting the same kind of in-depth analysis here, we examine price differences across the EU, noting in particular the contrasts between structurally low-concentration markets, such as Germany, and the high-concentration markets found in some other EU countries.

2.5.2 Data and outcomes

To descriptively illustrate the relationship between market concentration and prices, we collected data from Euromonitor Passport for five countries (Belgium, Czech Republic, France, Germany and Italy) between 2007 and 2022. The dataset includes information about the volumes and the values of beer sales for both on-trade and off-trade

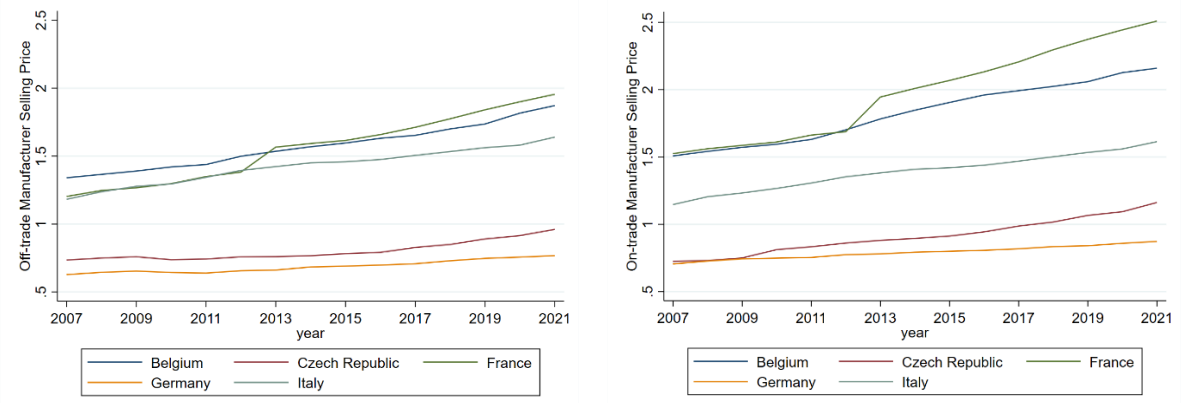
distribution. We have market shares of the main brewers in Belgium, Czech Republic, France, Germany and Italy for the overall beer market.

Values of beer production are measured in manufacturer selling price and retailer selling price. The manufacturer selling price (MSP) measures the price charged by manufacturer to retail stores. The retailer selling price (RSP) measures the price charged by retailers to consumers. The manufacturer selling price would include duties but does not consider sales tax, VAT, and wholesaler and retailer markups. Since this section focuses on the relationship between concentration in the beer manufacturing industry and prices, we look at manufacturing selling price to conduct the analysis. We compute the prices as the ratio of the manufacturer selling values to the volumes.

We use the HHI to measure the market concentration in the beer industry at national level.[198]

Figure 2.26 shows the price differences across the selected countries for both the off-trade and on-trade channel. Both distribution channels display an upward trend in the price. Germany has by far the lowest price for beer, almost 50% lower than in other EU countries. France displays a notable increase in the price in both channels following the introduction of new beer duties in 2013.

Figure 2.26: Off-trade (left) and on-trade (right) beer prices in euro for 5 Member States[199]



Source: Alethius calculations on Euromonitor Passport data

Price heterogeneity might stem from the heterogeneous demand of beer across countries leading to a different composition of consumption shares for different types (and costs) of beer. Figure 2.27 shows the per-capita volumes of beer sales for the two distribution channels between 2007 and 2021. The volumes in the off-trade segment have been roughly stable in all countries examined; Czech Republic only experienced an increase. All countries in the sample experienced a negative trend in the on-trade volumes, which is more pronounced for Belgium, Czech Republic and Germany, i.e. those with the highest levels of beer sales. COVID-19 had a particularly strong negative

[198] *We cannot use a market concentration index within each distribution channel due to lack of data availability at the manufacturer and distribution channel level.*

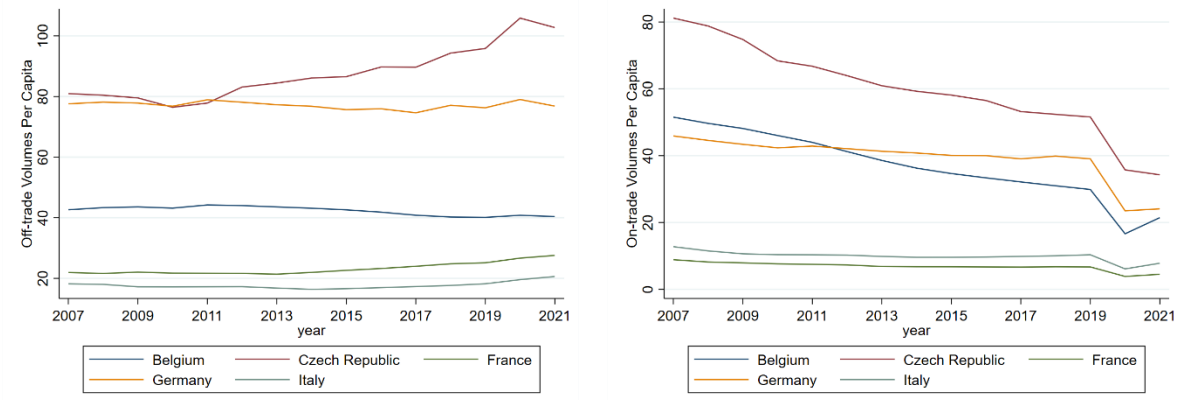
[199] *Figure 2.26 shows the trend of beer price between 2007 and 2021 on both off-trade (a) and on-trade (b) distribution channels in Belgium, Czech Republic, France, Germany and Italy.*

effect on on-trade volumes, as would be expected from the reduced level of social activities due the containing measures of the pandemic.

Looking at Figure 2.26 and Figure 2.27 jointly, it can be noted that the countries showing the lowest prices in the sample are the ones with the highest sales, and vice versa. Another insight from these analyses is that demand is not the only factor playing a role in explaining price differences across the selected countries: the two largest per-capita producers in terms of sales, Czech Republic and Germany, show the lowest prices in both distribution channels. The lowest price is observed in Germany, which however ranks second in terms of beer sales. The gap between Czech Republic and Germany in terms of prices and sales suggests that prices are determined by both demand and other factors, possibly including the level of competition.

To further assess the role of demand in explaining price differences, we collected data on beer consumption per capita (measured in pure alcohol litres) from 2019 WHO database:[200] Figure B.5 in the Annex shows the relationship between consumption per capita and MSP and it suggests a negative relationship. It is worth noting that the price observed in Germany seems particularly low even with respect to the observed level of consumption per capita, again suggesting that there could be factors other than demand in driving prices in Germany down.

Figure 2.27: Off-trade (left panel) and on-trade (right panel) volumes per capita for 5 Member States



Source: Alethius calculations on Euromonitor Passport data

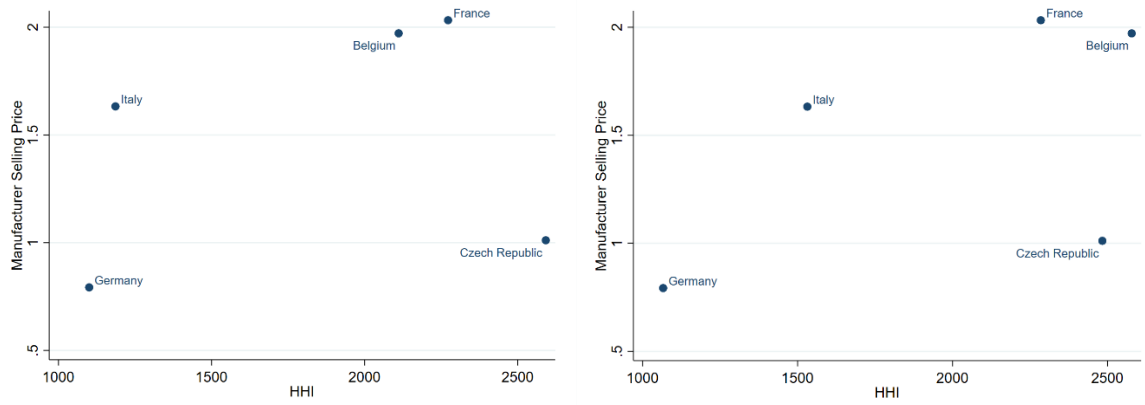
As explained in section 2.5.1, beer manufacturers use marketing and advertising as a differentiation strategy. As a result, brands can be a relevant driver of consumer choice: if consumers perceive different beer brands as differentiated, this may justify higher prices, all other things being equal. We therefore investigate whether this factor may play a differentiated role across the selected countries and, in particular, whether it can contribute to explaining the lower prices prevailing in Germany. We find evidence that brand loyalty does not seem to be an important driver of consumer choices in Germany. In particular, Swinnen (2011) argues that Germans tend to consume multiple brands of beer, with a 2001 report concluding that, amongst 25 heavily advertised consumer

[200] *Available at: https://gateway.euro.who.int/en/indicators/hfa_429-3053-beer-consumed-in-pure-alcohol-litres-per-capita-age-15plus/.*

goods, beer ranked last in terms of consumer loyalty. This can pressure companies to keep prices low.

To investigate the role of competition in explaining the observed price differences, Figure 2.28 shows a scatter plot between the HHI and MSP in 2021. Belgium, Czech Republic and France are more concentrated than Germany and Italy. Beer prices are higher in Belgium, France and Italy than Czech Republic and Germany.

Figure 2.28: Beer Price in euro and HHI based on revenues (left panel) and HHI based on volumes (right panel) for 5 Member States in 2021



Source: Alethius calculations on Euromonitor Passport data

The limited number of countries in the sample may not allow for drawing strong conclusions. While we do not observe any clear relationship between prices and market concentration, it is notable however that Germany, the country with the lowest HHI, has also the lowest prices.

We examine whether input costs show meaningful differences apt to explain the price gap between Germany and other countries. We collected data from PRODCOM, a Eurostat database collecting information on the values and volumes of production of several products that are used in the productive process of beer, and from FAOSTAT, a FAO database that includes the prices of some inputs, including the main crops. Figure B.6 in the annex shows the price in current euro of barley, carbon dioxide, coloured bottles, and hops for the 5 sampled countries between 2017 and 2021. Unfortunately, data are not available for all the inputs in each country. However, we observe that the cost of inputs is not systematically lower for Germany than for other countries, thus excluding the possibility that lower costs explain the observed price differences. Therefore, we are more inclined to infer that a meaningful share of the variability in the beer prices stems from more effective competition in the beer market in Germany compared to other national markets.

Large demand for beer in Germany may contribute to the observed low prices and market concentration. Above, we have focused on sales and consumption per capita: looking at consumption levels, the German market is the largest among the EU countries in our sample. A large demand for beer may foster the birth of new breweries leading to greater competition and lower prices.

Finally, and perhaps most importantly, the low levels of beer prices and market concentration can be related to the peculiarity of the German beer industry and the Purity Law, Reinheitsgebot, dating back to 1516 and in force until 1987, affecting market structure in a unique manner across countries in the panel. The law stated that German beer producers could not add any preservatives to beer. The associated German mark

of fully natural beer has helped thousands of breweries survive the competition imposed by big beer brand that use preservatives, keeping the market highly competitive. Other factors, such as low duties for the small beer producers, rigid regulation of television advertisements and long-term contracts between pubs and beer brands, might have also played a role in keeping the level of concentration low (Depenbusch et al., 2018). All these factors may have contributed to keep the beer market less concentrated, potentially to the benefit of German consumers, who pay far less than their European counterparts.

Although the number of breweries in Germany has remained high over the past two decades, there has been some evidence of collusive behaviour. The firms allegedly involved in these conducts (that accounted for more than half of beer sold) may have implemented them to seek to avoid the intense competition that existed in Germany. The German federal cartel office (Bundeskartellamt) imposed fines for price-fixing agreements between breweries that occurred in 2006 and 2008, which had allegedly increased prices by about 0.05 to 0.07 per litre, and for vertical price-fixing agreements between food retailers and AB-Inbev in 2006 and 2009 (Simon et. al., 2019).[201] Nonetheless, prices have remained low in Germany in comparison to other countries, suggesting that the low level of concentration has limited the ability of companies to actually alter market outcomes. In fact, reported manufacturer selling prices in Germany are about 60-66% lower in Germany than some other countries examined. Were it possible for prices in Belgium to replicate those of Germany, the gain could be on the order of 1.2b euros per year for Belgian consumers, though this figure is subject to all the usual qualifications concerning data and is not intended to represent an indication of gains from more intense competition.

2.5.3 Conclusions

In this section, we investigated the relationship between beer price and market concentration in Belgium, Czech Republic, France, Germany, and Italy. From a descriptive analysis of the data, we do not find a clear relationship between price and market concentration. However, Germany stands out as having both the lowest concentration, with many different brand owners, and the lowest prices. This may relate to culture and advertising, and also regulatory clearance of beer quality that has allowed for brand proliferation.

2.6 Mortgages

The purchase of a home arguably constitutes the most important component of household finance, as it often represents the biggest investment in an individual's lifetime for a large share of the population. In the overwhelming majority of cases, households will rely on a mortgage loan to finance the purchase of their house. In Europe, these mortgages are generally extended to households by banks. Since the Global Financial Crisis, the number of European banks has decreased by 40%.[202] However, despite this important decline, the European banking sector is still considered by some to be overcrowded and slow to consolidate, with many institutions dragging low profitability and high costs (Fernandez-Bollo et al. (2021)). As a result, regulators

[201] *See https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2014/02_04_2014_FernsehbiereII.html and https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Meldungen%20News%20Karussell/02_04_2014_Fernsehbiere.html*

[202] *Own computations based on ECB series of total number of credit institutions.*

encourage a trend towards even more consolidation in Europe, with the aim to increase financial resilience and stability.[203] From a competition standpoint, consolidation mechanically leads to higher concentration, and thus potential situations in which margins can be extracted to the detriment of consumers through the exercise of market power.

This section explores the price-concentration relationship on the European market for residential mortgages. A general industry background and the relevant literature are first discussed. The specific analysis is then conducted for the mortgage markets in seven European countries: Belgium, France, Germany, Italy, Lithuania, the Netherlands and Portugal. These countries exhibit large heterogeneity in the price that banks charge customers on their mortgages. The analysis reveals that those countries where prices are higher also tend to have higher level of banking concentration. Finally, the section concludes by presenting an illustrative estimation of potential gains that countries could obtain by moving from their current level of price to the best-practice one.

2.6.1 Industry background and literature

A mortgage loan is a long-term contract between a customer and a financial intermediary, acting as a mortgage lender in such case. In most European countries, mortgage lenders are predominantly Monetary Financial Institutions (MFIs).[204] Since 2013, banks in Europe have been holding more than 90% of residential mortgages (OECD, 2021).[205] This is in sharp contrast with the market in the US, for instance, where the share of mortgages originated by banks in 2019 was only around 30% (OECD, 2021). Other types of lenders in the US market include credit unions and independent mortgage companies. Because of the fewer type of lenders in the European markets, and the continuing trend towards more consolidation of the banking sector in particular, the question of the role played by competition naturally arises.

Mortgage loans represent a substantial share of the MFIs assets, and by far the largest share of the total lending to the household sector (see Figure B.7 in the Annex B.4). While the share of mortgage loans among total assets has been fairly steady over the past twenty years, its share of the total volume of loans to households has been steadily increasing.

The mortgage markets across European countries display considerable heterogeneity in terms of size and structure. This is expressed by differences in the characteristics of the final financial products (maturity, variable or fixed interest rate, interest rate fixation period, amortisation scheme), and can be explained by a variety of country-specific demand and supply factors, but also by different regulatory frameworks and

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[203] See for instance keynote speech of Edouard Fernandez-Bollo, member of the Supervisory Board of the ECB (https://www.bankingsupervision.europa.eu/press/speeches/date/2021/html/ssm.sp210611~87256e1f4b.en.html). The ECB also published a draft guide to banking sector consolidation in July 2020.

[204] The European Central Bank maintains a classification of financial intermediaries according to the following categories: monetary and financial institutions (MFIs), investment funds (Ifs), financial vehicle corporations (FVCs), payment statistics relevant institutions (PSRIs), insurance corporations (ICs), and pension funds (PFs). MFIs comprise central banks, deposit-taking institutions (of which the main part are credit institutions CIs), and money market funds. In essence, virtually all the lending for house purchase by MFIs will consist in loans granted by commercial banks.

[205] There is however heterogeneity across European countries in mortgage financing, as the share of non-bank financing is high in a few countries.

government support in place (tax treatment of the debt, regulatory caps on loan-to-value/loan-to-income ratio, early repayment conditions, government guarantees).[206]

The bulk of the price of a mortgage is given by the interest rate that is charged by the lender.[207] The interest payments can either be based on a fixed or on a variable interest rate schedule. For loans with a fixed interest rate, the initial rate fixation period (IRF) also varies, from one year up to the total length of the loan. The degree of interest rate variability or the length of the IRF determines whether the interest rate risk associated with the mortgage is primarily borne by the borrower or by the lender.

For loans extended at variable interest rates, most of the risk is carried by the borrower. Whereas, for loans with fixed interest rates, the associated risk lies on the lender, as the cost of funding the loans might deviate from the interests earned on them. As a result, fixed interest rate loans will include a term premium and a cost of prepayment option, thus making those products in theory more expensive. It is important to note that in the case of variable rates the lenders expose themselves to higher credit risk, since interest rate hikes can put financially constrained borrowers at default risk.

There exists a large body of theoretical and empirical literature studying the demand and supply determinants of the prevalent type of interest rate schedule. On the demand side, the financial conditions of borrowers as well as their level of education (particularly their level of financial literacy) can theoretically play an important role (Campbell and Cocco (2003)). These predictions have found substantial empirical support (see amongst other Paiella and Pozzolo (2007), Fornero et al. (2011), Ehrmann and Ziegelmeyer (2017), Agarwal et al. (2010), Gathergood and Weber (2017). On the supply side, the main determinants for the prevailing type of mortgage offered by banks are their funding and liquidity conditions (Kirti (2017), Fuster and Vickery (2014), Foà et al. (2015), Basten et al (2017)). More recently, Albertazzi et al. (2019) used a unique granular bank-level dataset across twelve eurozone countries to disentangle the influence of borrower demand factors from bank supply factors. They find that local demand conditions dominate in explaining the share of fixed versus variables mortgages.

The source of funds that banks use to finance the mortgage they extend to households is either deposits or external or wholesale funding. The rate that banks offer on mortgages will depend on the cost of their funding. As a result, the level of the money market rates is an important determinant of the funding costs and so the stance of monetary policy will impact lending supply. For fixed rate mortgages, the yield on the domestic government bonds will also impact the level of the interest rate offered by banks since bonds are an alternative, cheaper source of fixed income. Of course, because fixed rate mortgage bear more risk and are more expensive to maintain, there will exist a positive spread between the rate on the mortgage and the government bond yield. Other costs include the cost of originating and servicing the loans. Finally, the mortgage rate will also incorporate compensation for credit and liquidity risks, as banks use short-term liabilities to finance long-term assets. On the demand side, the main determinants are the interest rate on the loans, real estate prices, economic conditions (income, economic growth), as well as the regulatory framework in place (government subsidies, regulatory cap on loan-to-income, tax treatment of debt).

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[206] Van Hoenselaar et al. (2021) provide a comprehensive overview of the European mortgage market.

[207] The remaining of the pricing comes in the form of commissions and various fees that the borrowers have to pay, in addition to the interest rate on the loan.

Mortgage markets have many elements that make them imperfectly competitive. There is asymmetric information, very high entry and exit costs, and only a few sellers in the market for a very large number of buyers. Asymmetric information is likely to lead to market failures, as is well documented by an extensive body of theoretical literature (see for instance the seminal work of Akerlof (1970) or Rothschild and Stiglitz (1976)).

Empirically, there is evidence that increased concentration (a consequence of imperfect competition) tends to be associated with less competitive prices in the European loan markets. At the national level, for instance, Jappelli (1993) concluded that significant pricing differences between Northern and Southern Italian banks could not be fully accounted by differences in risk or cost structure, and had to reflect to some extent the higher concentration of banks in the south of Italy. More recently, Corvoisier and Gropp (2002) estimated a Cournot model of bank pricing on longitudinal data for Eurozone countries and found that the increased concentration may have led to collusion and higher interest margins of banks for loans and demand deposits.

However, it is worth noting that bank mergers have been found to have opposite impacts on loan competition, both in theory and in actual data. On the theoretical side, Carletti et al. (2002) provide a model where a merger results in an upward pressure on the loan rates by enlarging the acquiring bank's market share. However, the merger can also lead to downward pressures on the rates since it has the means to result in efficiency and profitability gains. Empirically, Sapienza (2002) studies the effect of banking mergers on individual business borrowers in Italy and finds that while mergers can benefit borrowers by lowering the interest rates charged by banks, such positive effect can be offset by the increase in market power which induces larger banks to reduce the supply of loans to small borrowers. Cerasi et al. (2010) propose a test based on a monopolistic competition model to assess the impact of horizontal mergers on competition in the banking industry. Their findings suggest instances of both favourable and detrimental mergers in France and Italy.

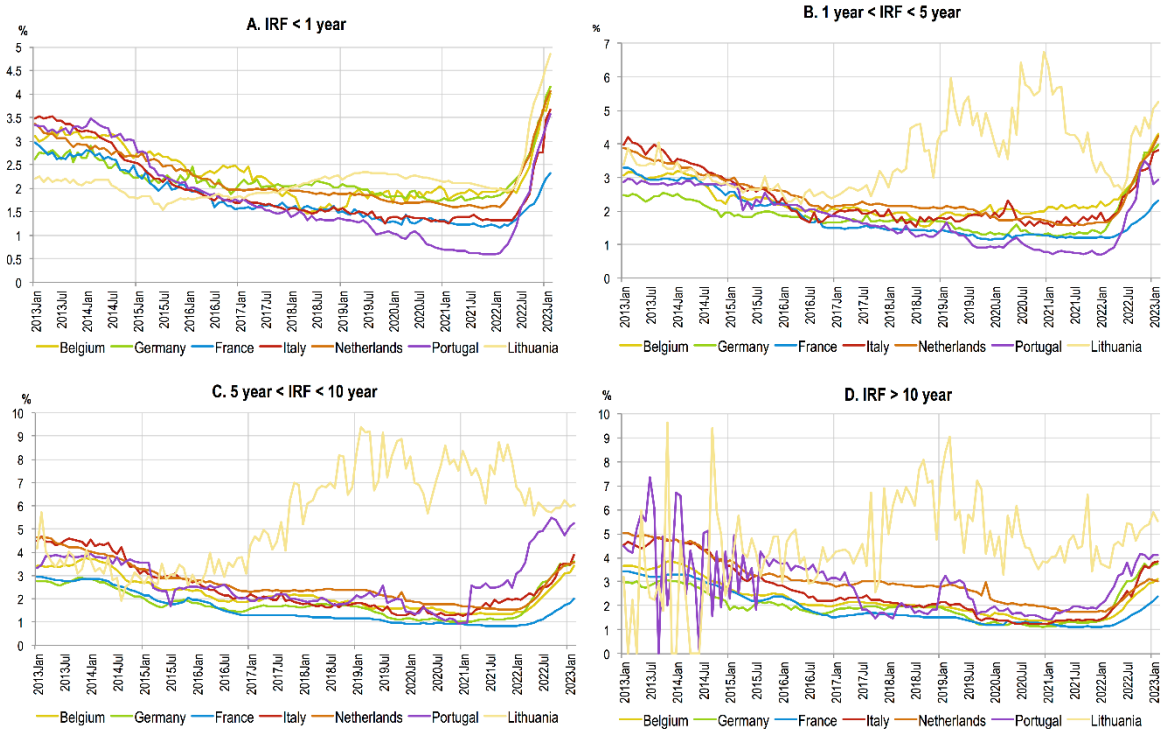
The next section presents the data and outcomes of the price-concentration study for the seven countries of reference.

2.6.2 Data and outcomes

As explained above, the bulk of the price of a mortgage is given by the interest rate. In the data, one can find four different mortgage interest rate series depending on the IRF of the loan. Those are: (i) interest rates with an IRF below one year, which are those loans that are called variable rate loans, (ii) interest rates with an IRF between one and five years, (iii) interest rates with an IRF between five and ten years, and (iv) interest rates with an IRF of more than ten years. Note that in the analysis presented below, the interest rates refer to those applied for new loans in the reference period, as opposed to the stock of outstanding loans. Figure 2.29 shows the historical evolution over the past ten years of the four different interest rate series for the set of seven countries analysed. Despite the common long-term movements amongst most countries that can be observed between series in each panel, there exists substantial heterogeneity in the interest rates in the cross-section. In each of the four panels, the spread between the highest and the lowest interest rate is at least one percentage point. We will subsequently look at the rate premium, which has similar results to looking at the interest rates alone.

It is interesting to note that the gap between the fixed and variables rates on new mortgages granted to household has gradually decreased over the past twenty years in the Euro area (see Figure B.8 in Annex B.4).

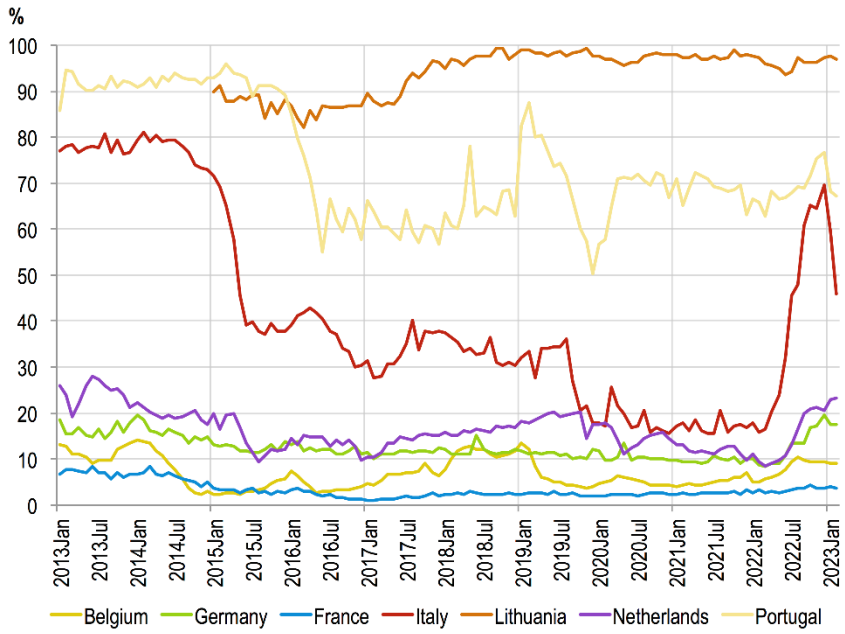
Figure 2.29: Interest rate on mortgage loans with different IRF



Source: ECB Statistical Data Warehouse

To gain understanding of the rather unusual behaviour of the interest rates series with IRF above one year for Lithuania, one can look at the share of variable rate mortgage in the total volume of new mortgages, whose historical evolution for the set of countries is shown in Figure 2.30. First, there is considerable heterogeneity in the proportion of fixed versus variable mortgage loans across countries, as well as in the variation of those two main types of products within countries. More specifically, France, Belgium, Germany and the Netherlands have a share of variable mortgages below 20% and have experienced little time series variation over the past decade. By contrast, Lithuania, Portugal and Italy have much higher shares of variable rate mortgages and those tend to be more volatile too, which is particularly true for Italy and Portugal. Lithuania is an extreme case, as virtually all the new mortgages originated in the country are with variable interested rates. This then helps to explain the behavior of the interest series for Lithuania in panels B., C., and D. of Figure 2.29. Because those markets feature such little volume, they are more likely to display unusual price dynamics, as the limited number of trades will not result in any smoothing effect on the observed average price.

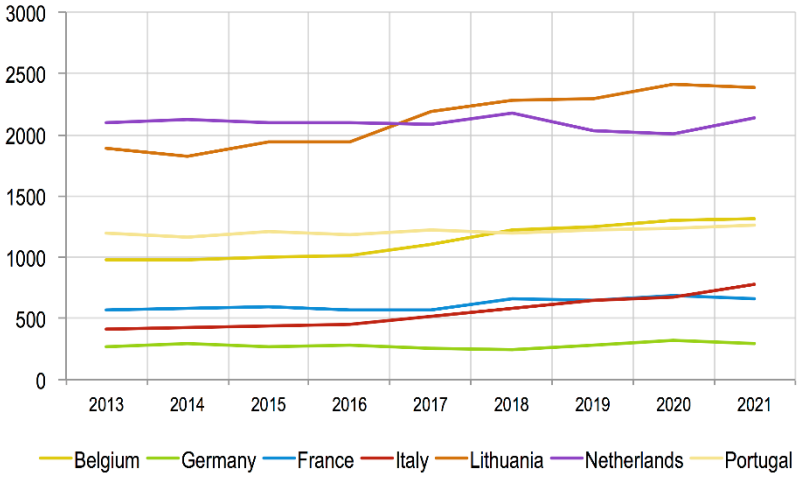
Figure 2.30: Share of variable rate loans in total new loans for house purchase



Source: ECB Statistical Data Warehouse

Turning to concentration, the following measures are available: HHIs for total credit, HHIs for total assets, and the share of the five largest credit institutions in total assets. These concentrations measures are available for credits institutions (CIs), a subset of financial intermediaries defined in the category MFIs. As described in footnote 204, CIs represent most of the intermediaries listed as MFIs. As expected, all three measures are almost perfectly correlated (see Figure B.9 in Annex B.4). The historical evolution of concentration in the banking sector over the past decade is shown in Figure 2.31, and it displays substantial heterogeneity across countries. Three groups of countries emerge. One group with relatively high concentration including Lithuania and the Netherlands, one group with very low concentration including Germany, France and Italy, and a last group in between with Belgium and Portugal. Overall, concentration tends to have slightly increased in almost all countries since 2013.

Figure 2.31: Historical Herfindahl indices for credit institutions, total assets



Source: ECB Statistical Data Warehouse

The data thus suggests that (i) prices in the mortgage markets of the seven countries display important level of heterogeneity for otherwise likely similar mortgage products, and (ii) the concentration levels in those countries is also heterogeneous. The key question is now whether one finds an association between the level of prices and the level of concentration. To answer the latter, Figure 2.32 shows the price-concentration graph of the mortgage market. Each panel plots one of the four interest rate mortgage series against the HHI indices for the year 2021, the latest year at which concentration measures were available.[208,209] Overall, the figure reveals that, regardless of the initial interest rate fixation of the mortgage rate, countries with more concentrated credit institutions also tend to have higher prices. The relationship seems particularly more pronounced for fixed rate mortgages with the longest IRF (panel D.). While the analysis conducted here cannot claim a causal relationship, it is likely that cross-sectional differences in price reflect to some extent differences in concentration.

It could be tempting to classify Portugal as an outlier in almost all of the four panels.[210] On the one hand, it has the lowest interest rate on mortgages with variable rates or fixed rates with an IRF below five years. On the other hand, it has the highest interest for the two other types of fixed rate mortgages with longer IRF. However, Figure 2.30 revealed that, in Portugal, about 70% of all new mortgages are extended with variable rates. It might then be the case that the interest rates with IRF above five years (panels C. and D.) do not say much, as those products might be very rare. One would need to observe the corresponding lending volumes to provide a more thorough explanation. However, the ECB only provide lending volume in the aggregate for all four types of mortgages.

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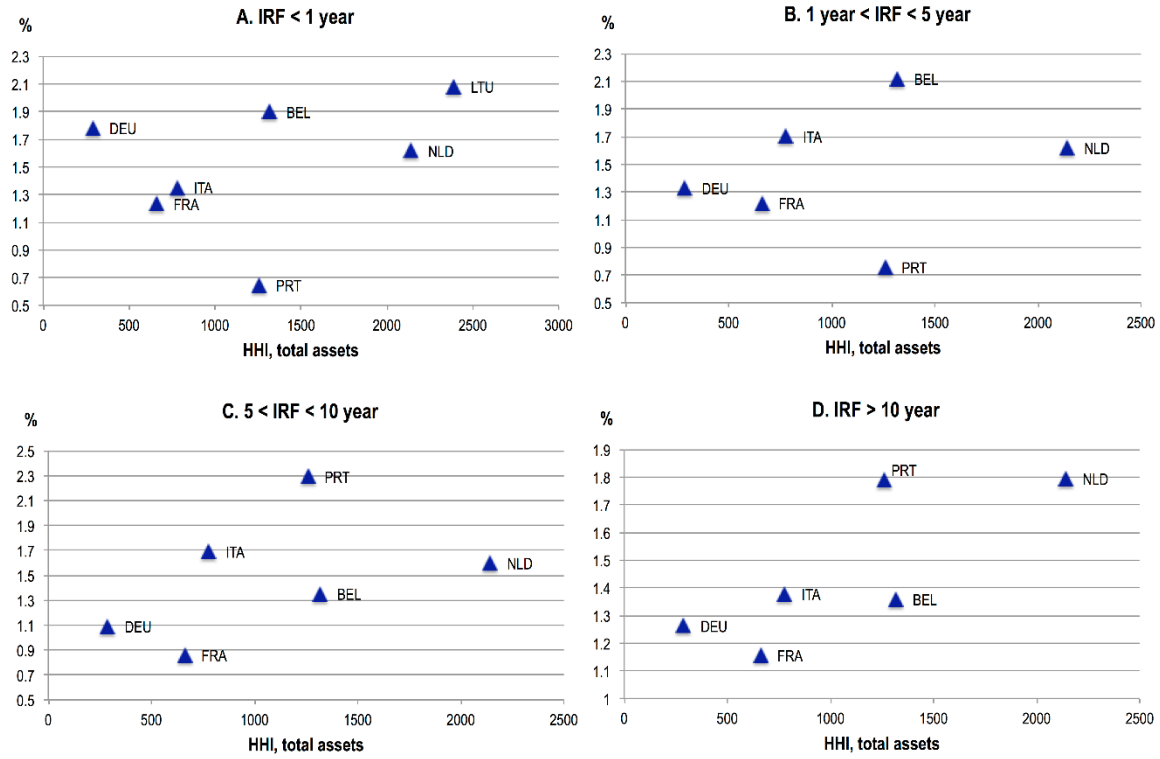
[208] *Lithuania has been dropped from panels B., C., and D., since those products are almost inexistent in the country as argued above.*

[209] *The results presented in this section are not specific to focusing on the latest year for which concentration measures were available. The overall positive price-concentration relationship is robust to the choice of the year. Similar price-concentration figures for years prior to 2021 can be found in the Annex.*

[210] *If one were to fit a trendline in the graphs, the distance between such line and Portugal would be the longest in all four panels.*

Figure 2.32: Price-concentration graphs, mortgage interest rates, 2021



Source: ECB Statistical Data Warehouse

Lastly, the price-concentration relationship is also analysed for a slightly different measure of the price, namely the rate premium. As mentioned in section 2.6.1, for fixed rate mortgages, the yield on the domestic government bonds will impact the level of the interest rate offered by banks. This is because buying bonds represents another source of fixed-income revenue, with much lower associated risks and costs. The spread between these two rates can thus be interpreted as a kind of margin that the bank earns on the mortgages. Because this is relevant for fixed rate mortgages only, the analysis is restricted to those two mortgage types with fixed interest rates and an IRF of above five years. Figure B.14 in Annex B.4 shows the price-concentration graph when the price measure is the interest rate minus the yield on the corresponding ten-years government bond – the spread. The positive association remains virtually unchanged. One can thus conclude that those countries with more concentrated banking sector also tend to be those countries where the difference between the interest rates charged on mortgages and the yield on the corresponding government bonds is the highest. Just as an example, if mortgage buyers from the Netherlands were charged the lowest mortgage rate among the sample of countries, annual savings could amount to 4.4b euros, though this figure is not intended to represent gains from more intense competition.

It is worth noting that this is a static exercise. Understanding whether changes in bond prices in economies with less competitive banking markets result in higher margins extracted from loans would require a dynamic analysis in which changes in bond yields can be related to changes in mortgage interest rates.

2.6.3 Conclusions

There seems to exist a positive correlation between the prices of mortgages as measured by interest rates, and the concentration level of the banking sector. This relationship seems to be more pronounced for mortgages with longer IRF and is robust

to measuring prices as the spread between the mortgage rates over a government bond yield.

2.7 Modern consumer retail

Modern consumer retail refers to all formats of retail stores such as hypermarkets, supermarkets, department stores, discount stores, cash and carry stores, specialty stores, convenience stores and online retail. Modern food retailers have to some extent replaced traditional grocery stores among the developed countries since they offer a much larger variety of products for a cheaper price. Ernst & Young, Cambridge Econometrics Ltd. and Arcadia International (2014) shows that the share of the top 10 European food retailers accounted for 31% of pan-European sales in 2011, increasing from 26% in 2000.[211]

In this study, we descriptively focus on the relationship between concentration and prices charged by grocery retailers for food. Using a sample of 5 Member States (Belgium, Denmark, France, Germany, Poland) and the United States, we seek to understand key parameters related to competition in modern consumer retail.

Effective competition in this sector can have particularly important beneficial effects for the economy, as grocery prices influence not only the affordability of basic goods, but also the overall well-being, financial stability, and quality of life of most consumers. Increases in inflation in 2022-2023 have had a significant impact on the price of basic goods in Member States which have surged by 10% (Nickel et al. (2022)). Most of these increases is attributable to the spike in the energy prices following the beginning of the Ukraine war, which resulted in higher costs of producing and processing food. McKinsey and Company Survey data (2023) suggests the price increase of basic food goods has caused consumers to become more price sensitive as the percentage of consumers looking for ways to save money when conducting grocery shopping in 2022 rose by 12 percentage points from 41% in 2021 to 53% in 2023. Against this background, maintaining effective competition can be particularly important.

2.7.1 Industry background and literature

Several factors determine where consumers shop, including retailer location, price, in-store environment, and assortment. Beyond these dimensions of competition, retailers also often compete via announced sales on major products. The academic literature suggests this is because sales on more purchased products are more effective at increasing consumer footfall (see MacDonald (2000), Chevalier et al. (2003), Hosken and Reiffen (2004), Ennis and Kuhn (2021)).

In the last decade, one of the most prominent market changes across many Member States has been the expansion of discount modern consumer retailers such as Aldi and Lidl,[212] both in terms of number of stores and their market share. This has placed price pressure on larger stores to price match at least some items in their stores with those

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[211] See page 23, section 1.3 of 'the economic impact of modern retail on choice and innovation in the EU', Ernst & Young, Cambridge Econometrics Ltd. And Arcadia International (2014). https://ec.europa.eu/competition/sectors/agriculture/retail_study_report_en.pdf

[212] Geyskens et al. (2023) found that by 2019 hard discounters such as Aldi and Lidl had gained a 'firm footing' in the European Grocery sector with a market share of 22% in the Netherlands, 31.6% in Poland and over 40% in Germany. Recent media articles suggest this share is likely to have grown, for example Lidl opened a £300 million warehouse on the 7th of September to support expansion in the UK market (see Largest Lidl warehouse in the world opens in Bedfordshire | ITV News Anglia for further details) and Aldi set a record number of 160 openings in the last 5 years in Italy (see https://www.efanews.eu/item/33248-aldi-crosses-the-finish-line-of-160-points-of-sale-in-5-years-in-italy.html for further details).

of the discount chains. The case law suggests that discount modern consumer retailers tend to mostly compete for price sensitive consumers from low- and middle-income households, whereas some supermarket chains choose not to compete with discounters on price and target consumers from higher income households.[213]

A 2009 European Commission document estimates that the net operating margin of food retailers is around 4% (EC, 2009).[214] Given these low margins, large food retailers have attempted to increase their profitability through mergers and the acquisition of smaller retailers.

A competitive assessment of the modern consumer retailer sector is complex, as there are several dimensions of competition, as well as structural and behavioural factors that can affect them. The competitive conditions prevailing in a specific will depend on the combination of all these factors. To provide an industry overview, below we discuss each of the following factors that we deem relevant for shaping competition among food retailers and refer to the relevant related economic literature:

- consolidation;
- buyer power;
- entry and operating regulation;
- online shopping;
- uniform national pricing;
- private label products;
- advertising and promotions.

2.7.1.1 Consolidation

The industry is well documented to have gone through a heavy degree of consolidation in the early 2000s (Stanton (2018)).

The implications of consolidation on prices and other market outcomes are not obvious based on economic theory. On the one hand, consolidation may grant large food retailers cost reductions through greater economies of scale or better control over distribution channels which they could then pass onto consumers. Consistently with this, evidence suggests that margins have remained low in food retail, notwithstanding the consolidation wave observed.[215] However, because horizontal mergers and acquisitions generally increase market concentration, they may also create the opportunity for large retailers to exercise market power, at the expenses of consumers. The empirical economic literature provides evidence of this effect, especially as a consequence of mergers involving large retailers:

- Allain et al. (2017) find that food prices increased significantly following a merger between the 2nd and 5th largest food retailers in France, particularly the prices charged by the rivals of the merged entity in local markets where concentration increased;

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[213] This is particularly evidenced by merger decision M.3905: Tesco/Carrefour. The merger was approved in part since the consumer profile for Tesco and Carrefour shoppers is significantly different. Tesco is found to compete strongly on price, sales and discounts with other brands such as Globus and Kaufland (Lidl), whilst Carrefour focuses on the most affluent consumers.

[214] Competition in the food supply chain (2009). European Commission Staff working document, available at https://ec.europa.eu/economy_finance/publications/pages/publication16065_en.pdf.

[215] A 2023 McKinsey and Company report suggests Earnings before interest and tax (EBIT) Margins for European retailers in 2022 were 3% and have remained at that level since 2019 (0.0 pp change). See living-with-and-responding-to-uncertainty-the-state-of-grocery-retail-2023-europe.pdf (mckinsey.com) for more details.

- Argentesi et al. (2021) find that post-merger two Dutch retailers increased their profit margins by making their product offerings converge in locations where they did not directly compete, thereby rationalizing supply costs, whilst also repositioned their product offerings to reduce closeness of competition in overlap areas (i.e. areas where their stores were located close enough to each other to be direct competitors);
- Hosken et al. (2018) analyse several modern retail mergers and find that net effect of consolidation on prices depends on the level of concentration of the market: in particular, they find that mergers in concentrated markets tend to lead to higher prices post-merger (often around 2% or more), whereas mergers in unconcentrated markets are regularly associated with declines in prices, consistently with the efficiency effects described above;
- Hovhannisyan et al. (2019) show that a higher market concentration of around 5% leads to an increase in prices of around 18% in the US. The study uses the product bar codes, store and retail real estate data to get precise estimates of the effect of market concentration on food retail prices. The main estimation problem of the relationship is the endogeneity bias discussed in section 2.1; to address this, they use new data on real estate investments in the food retail sector to see whether a new establishment affects both prices and market concentration;
- Rickert et al. (2021) examine the effects of a merger between a supermarket chain and a discount retailer in Germany and find that the merged entity and its competitors raised average prices after the merger by as much as 7% in regions where the merger particularly increased concentration.

The adverse effect of market concentration on prices also holds true for smaller grocery stores. Ma et al. (2019) use data from the California Women, Infants and Children Supplemental Nutrition (WIC) Program to show that increased market concentration leads to an increase in prices in smaller grocery stores, particularly when there is no supermarket in the local area, suggesting that the lack of competition from supermarkets leads small food retailers to increase prices when a common measure of market concentration (the HHI) and the market share of each food retailer is high.

Due to concerns over consolidation and the higher concentration ratios which consolidation can cause, market investigations and studies by national competition authorities have been common, particularly following the consolidation of the industry in the 2000s and 2010s. For instance, a 2012 study by the European Competition Network recorded 36 market monitoring actions that had been taken by 20 Member States between 2004 and 2012.[216]

2.7.1.2 Buyer power

There is also evidence that the high concentration found in food retail can have additional consequences beyond high pricing to consumers, notably via buyer power. Buyer power is discussed in a European Commission decision concerning Dole Food which suggests that strategies can include threats of delisting, reducing shelf prominence and demanding reverse payments.[217] While buyer power, if present, could result in lower purchasing prices for retailers, Dobson (2004) highlights that lower purchasing prices for retailers are only of value to consumers when they translate to

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[216] *See section 4.6 'food retail' of European Competition Network (2012) 'Report on competition law enforcement and market monitoring activities by European Competition authorities in the food sector'. Available at Final Draft (europa.eu)*

[217] *Case COMP/M.8829 – Total Produce/Dole Food Company of 30/07/2018, par. 83.*

lower long-term retail prices, as buyer power can also distort supplier and retailer competition, and the long-term effects could still be adverse for consumers.

In 2014, the EDEKA group, the largest supermarket corporation in Germany was fined by the German Cartel Office (Bundeskartellamt) for making illegal demands on four manufacturers of sparkling wine to grant them special conditions. The decision (Bundeskartellamt, 2014)[218] shows that an increase in market concentration following a merger between the EDEKA group and the discount chain "Plus" played a key role in forcing suppliers to accept special conditions. However, the increase in the bargaining power of food retailers on suppliers may also lead to lower retail prices for goods produced by large food companies.

In response to concerns about buyer power, some governments have placed constraints on buyers negotiating techniques. For example, the UK adopted a 'groceries supply code of practice' in 2009 and subsequently appointed a groceries code adjudicator in 2013 to help improve the relationship between big retailers and small suppliers and prevent certain practices including a reduction in the incentives and ability of suppliers to invest and innovate in new product lines or production processes.[219] Other governments have determined that producers have an ability to counteract buyer power.

Whether it is appropriate to restrict retailers' ability to exercise buyer power, however, depends on the sector at hand. For example, in the 2015 Demb/Mondelez/Charger merger decision,[220] which concerns coffee sellers, the Commission found that French retailers may not have the necessary buying power to counter potential price increases in the filter pad[221] coffee market due to Mondelez being perceived as a 'must-have' brand.

2.7.1.3 Entry and operating regulations

Differences in competitive conditions between Member States could partly be explained by differences in entry and operating rules, which can be governed by a variety of national and local rules. A review of responses by Member States to the OECD PMR survey[222] displayed in Table 2.8 reveals significant variations both in Member State shopping hours and licensing requirements. Both could impact the setting of national level pricing strategies of large food retailers and their national level market entry decisions. For example, authorisation is always required for establishing a retail outlet in Belgium and Poland, sometimes required depending on the size of the retail establishment in France and Germany and not required regardless of retail outlet size in Denmark. Equally, whilst all sampled Member States reported some form of restriction on opening hours, there was significant variation in the hours and days which stores are permitted to be open. Retailers in Denmark, France and Poland are permitted to be open at any time of day whilst retailers in Belgium and Germany are only permitted to be open between certain hours. Additionally, retailers in Germany are not permitted to be open on Sundays.

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[218] *See Bundeskartellamt case summary (2014) 'Food Retailer EDEKA violates prohibition to demand unjustified benefits from dependent suppliers' for further details. Available at B2-52-14.pdf (bundeskartellamt.de)*

[219] *Explanatory Notes to Bills: GROCERIES CODE ADJUDICATOR BILL [HL] (parliament.uk)*

[220] *Case Comp/M.7292 – Demb / Mondelez / Charger OPCO of 05/05/2015.*

[221] *Filter pad coffee in this sense refers to pre-packaged individual portions of roast and ground coffee which are used in home coffee machines.*

[222] *The responses of this survey are available online at Indicators of Product Market Regulation - OECD.*

Table 2.8: Selection of OECD PMR survey responses concerning retail outlets selling food and/or beverages

Member State	*Are retail opening hours regulated?*	*Authorisation needed to establish a retail outlet?*	*Are additional licenses or permits needed to establish a retail outlet (excluding licences or permits related to health and safety and environmental protection regulations)?*
Belgium	Yes – retail trade outlets can only be open at the following times. Weekdays: 5am-8pm Saturdays: 5am-9pm Sundays and Bank holidays:5am-8pm Additionally, shops must be shut down at least 45 days per year	Always Required	Not Required
Denmark	Yes – Retail trade outlets can be open at any time of day and no restriction on number of hours a retail trade outlet can be open but retail trade outlets must shut down for at least 13 days a year	Not Required	Not Required
France	Yes – Stores can only be open for a maximum of 12 Sundays or holidays per year.	Required depending on size	Not Required
Germany	Yes – retail trade outlets can only be open at the following times. Weekdays: 6am-8pm Saturdays: 6am-9pm Sundays and Bank holidays: Closed[223]	Required depending on size	Not Required
Poland	Yes - Retail trade outlets can be open at any time of day and no restriction on number of hours a retail trade outlet can be open but retail trade outlets must shut down for at least 13 days a year	Always Required	Required depending on size

Source: Project Team based on OECD PMR survey responses

2.7.1.4 *Online shopping*

The structure of retail options faced by consumers has evolved with the continuing development of online grocery options. Many of the larger European food retailers now offer online delivery options either through their own delivery services or through partnership with logistic specialists (such as Ocado[224]). Yet, despite predictions for future growth, the online segment currently only makes up a small proportion of the

[223] *Germany's response to the OECD PMR stated that retail trade outlets were closed on Sundays and holiday (question Q7a.4a.5a_iii) but also, they responded that retail trade outlets are open a maximum of 4 Sundays or holidays (Q7a.4a.7a).*

[224] *Ocado group are food logistics specialists which operate throughout Western Europe, their website reports that they are currently partnered with several large European food retailer including Groupe Casino in France, Alcampa in Spain and ICA in Sweden. See https://www.ocadogroup.com/about-us/osp-partners/ for further information.*

grocery market with a 2023 McKinsey and Company report estimating that online grocery held approximately 6.1% of the European grocery sector in 2022.[225]

2.7.1.5 Uniform national pricing

A somewhat surprising feature of supermarket pricing is that there is often uniform national pricing. Consequently, branches of national supermarket chains may not be directly permitted to alter their pricing to respond to local market power. Della Vigna and Gentzkow (2019) highlight that uniform national pricing may lead to a loss of profits as firms cannot react to local market conditions. In contrast, Dobson and Waterson (2005) find that uniform pricing may lessen competition which could increase retailer profits. European Commission case law and price dispersion studies provide evidence of uniform national pricing:

- a 2005 European merger decision[226] finds some evidence of Tesco setting store-by-store prices in the Czech Republic; however, market participants found that a local/regional approach to pricing had only been 'started in a limited way'. Additionally, several more recent European Commission merger decisions[227] find that prices in modern food retail by large chains tend to be set on a national basis;
- a price dispersion study focused on the US market, conducted by Hitsch et al (2021), found a far greater level of price dispersion between different retail chains than between different geographic premises of the same retail chain. This suggests large retail firms tend to adopt national pricing strategies and then compete on this basis rather than focusing on localised or 'store by store' strategies. This finding is supported by the work of DellaVigna and Gentzkow (2019) who show that most U.S. food, drugstore, and mass-merchandise chains have opted to set the same (uniform) prices across their stores.

Several authors discuss why localised pricing is not more common. Della Vigna and Gentzkow (2020) posit that prices are not set locally because of managerial inertia and behavioural factors. Hitsch et al (2021) suggest that many retailers do not implement a 'store-by-store' strategy as they are often too complex and impractical to implement;[228] therefore it may simply be that localised pricing is, at least in some cases and at some levels of locality, unfeasible for retailers.

An alternative explanation may be that size is relevant for local pricing, as locally high prices may be successfully implemented by very small stores. Marshall and Pires (2018) show that consumers prefer to shop at stores with a low product variety where they pay high prices to minimize the travel costs. Their findings suggest that the perceived cost

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[225] These results were found using weighted average of total grocery revenues from Germany, the UK, the Netherlands, France, Sweden, Spain, Italy, Portugal, Czechia and Poland, see page 37 of Mckinsey and Company's 2023 report, 'the state of grocery retail 2023, Europe: living with and responding to uncertainty' for more details. living-with-and-responding-to-uncertainty-the-state-of-grocery-retail-2023-europe.pdf (mckinsey.com)

[226] Case COMP/M.3905 – Tesco / Carrefour of 22/12/2005.

[227] For example, the market study associated with M.4686 Louis Delhaize/Magyar Hipermarket finds that chains tend to compete on a national basis for pricing policy in Hungary and the market study associated with M.4276 Ahold/Konmar finds that pricing decisions in the Netherlands are made on national basis.

[228] They concluded this is due to difficulties they had in distinguishing between store-level price and promotion effects and that given that they had a similar granularity of a data to that available to that used in the industry it was unlikely that this was feasible in practice. They also stated that this explanation conforms with informal discussions they had with retail chain managers.

of consumer travel is much higher than the increase in the marginal cost of products and the cost of facing a narrow number of products.[229]

2.7.1.6 Private label products

Another aspect that is relevant in shaping the competitive dynamics between retailers is the presence and popularity of private label products. A 2023 study by McKinsey and Company found that sales from private labels represented approximately 36.3% of the European market in 2022. Additionally, 36% of consumers surveyed in 2023 claimed they would prefer buying private brands over national brands, an increase of 22% from 2022.[230] Bonfrer and Chintagunta (2004) find that price-sensitive consumers are the main buyers of private labels. One of the 2023 McKinsey and company studies other main findings was that consumers were also becoming increasingly price sensitive. It is therefore unsurprising that private brands are increasing in popularity. Furthermore, the margins in food manufacturing are typically higher than the margins in food retail which may provide incentive for food retailers to vertically integrate.[231]

The increasing popularity of private label also has upstream implications. Chung and Lee (2018) find that the introduction of store brands typically results in a higher degree of retailer control over price at the expense of wholesaler control. This may not be a bad outcome for consumers in the short term as Ciapanna and Rondinelli (2014) find that an increase in buying power tends to lead to lower final prices in concentrated markets with buying groups, whilst markets without buying groups which are less concentrated are associated with an increased level in prices.[232]

2.7.1.7 Advertising and promotions

Advertising and promotion also play a significant role in food retail pricing and competition. Indeed, numerous academic papers discuss this, and a review of retail store marketing strategies is provided by Glanz et al (2012). The review includes a Walters and Jimil (2002) who find that 39% of items in consumer baskets were promoted by retailers and that approximately 30% consumers surveyed were highly sensitive to price specials. The Glanz et al review (2012) also highlights that price promotions also have been found to have implications on how food retail chains compete with each other. The use of financially significant and regular price promotions has been found to lower the price image of stores and decrease their perceived value (Desai and Talukdar 2003, Sirohi et al 1998).

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[229] *Although this has not always been the result of studies conducted by national competition authorities, for example, an investigation into food retail in Paris by the Autorité de la concurrence found that the establishment of new stores led to reduction in the financial results of the incumbent (Casino) but it did not lead to a reduction in store prices, see Food distribution in Paris | Autorité de la concurrence (autoritedelaconcurrence.fr) [FRENCH] for more details.*

[230] *See McKinsey and Company 2023 consumer survey, which is contained within McKinsey and Company 2023 report 'the state of grocery retail 2023, Europe: living with and responding to uncertainty'. The survey has a sample of 12,277 (n=12,277) from Belgium, Denmark, France, Germany, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, and United Kingdom and the sample has been matched to general population of 18+ years of age. See page 11 of living-with-and-responding-to-uncertainty-the-state-of-grocery-retail-2023-europe.pdf (mckinsey.com) for more details.*

[231] *See McKinsey and Company 2023 report, 'the state of grocery retail 2023, Europe: living with and responding to uncertainty' for more information on the margins of food retailers and suppliers. Exhibit 8 compares the margins of retailers and the largest CPG (consumer goods producers) and finds that the average EBIT margin of grocery retailers was 3%, compared to 18.6% for consumer goods producers.*

[232] *The authors collect data on 13 food categories for nine euro-area countries at a regional level. Their results are in line with a well-established literature that shows a positive relationship between market concentration and prices.*

2.7.2 Data and outcomes

We selected five European Member States – Belgium, Denmark, France, Germany, Poland, and the USA – to perform a descriptive analysis of the relationship between food prices and market concentration. Our aim is to study whether a higher market concentration is correlated with higher selling prices for consumers. However, the drawback of such a cross-country analysis stems from differing food cultures between countries. Therefore, food prices may depend on the level of consumption in each country. To attenuate the impact of this factor of the results of our analyses, we select a bundle of cross-country homogeneous goods. In particular, we focus on data on prices for 1kg apples, 1kg chicken, 12 eggs, 1kg flour, 1l milk, 1kg onions, 1kg potatoes, 1kg rice, 1kg sugar and 1kg tomatoes.

The website 'www.globalproductprices.com' collects information on prices of each food product across countries from the most important food retailers in each country and standardizes the measure in US dollar to conduct comparisons across countries. We have performed an analysis based on the price of the selected bundle of goods in July 2023 only. The prices are adjusted for the purchasing power parity using the OECD PPP adjustors.[233]

Finally, we gathered information on the sales of the largest food retailers from European Supermarket Magazine country reports and used this to compute a market concentration measure (HHI). In particular, we gathered information on the turnover of the top 10 food retailers in 2020 for Belgium, in 2021 for France, Germany, Poland and in 2022 for the USA and on the turnover of the top 5 food retailers in 2021 for Denmark. In our case, the market share is the ratio of the specific-retailer sales to the sum of all the sales for the top 10 food retailers for each country. However, a national measure of market concentration is somewhat imperfect, since as explained above there seems to be also a local dimension to competition among grocery retailers.

Figure B.15 shows the relationship between good prices in PPP and concentration index. Overall, the correlation between market concentration and food prices is positive for a number of products. However, we cannot assess the relationship of each good and market concentration in a specific month. We address this by creating a price index. We then aggregate prices using consumption per capita of each good at a worldwide level as a weight.[234]

Figure 2.33 shows the relationship between the price index and the market concentration index (HHI). A broad correlation seems to arise: this basket of basic goods is more expensive in countries where market concentration is higher. However, Belgium and Denmark seem to behave in a different way with respect to other sampled countries. To verify the robustness of the results, we create 10 price indexes iteratively excluding one good from the overall price index. Figure B.16 shows that the positive relationship between the price index and market concentration holds when we exclude a good from the basket. The relationship appears less steep only when we exclude flour, but the positive association holds.

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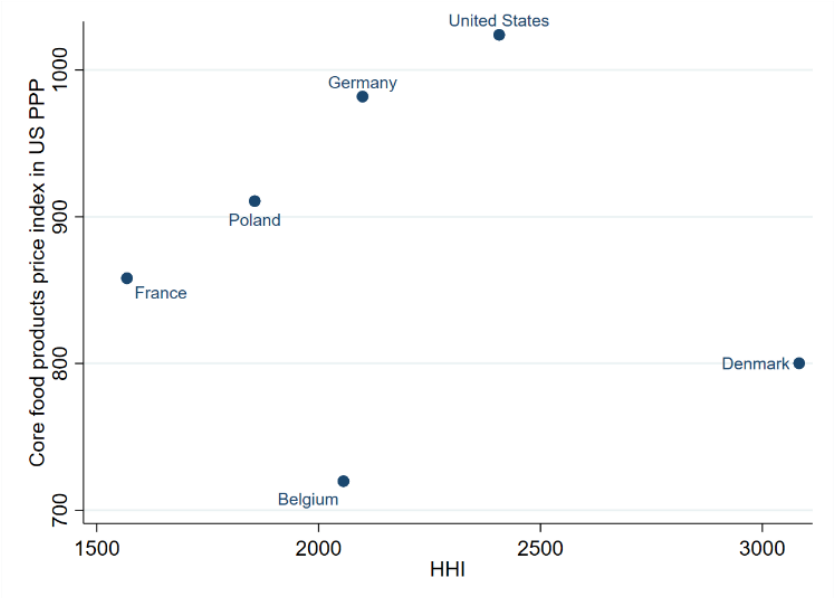
[233] Available at: https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm.

[234] OECD-FAO Agricultural Outlook 2023-2032 provides the good-specific consumption per capita data. We use 2022 to create the consumption weights. As the OECD-FAO dataset does not provide the consumption per capita of apple, milk, onion, sugar and tomato, we gather this information from FAOSTAT in 2020

Figure 2.33: Relationship between July 2023 price index and HHI at country level



Source: Project Team based on www.globalproductprices.com and https://www.esmmagazine.com.

The heterogeneity in prices of the same basket of goods across countries might stem from the heterogeneous preferences of consumers across countries. Indeed, Reiff and Rumler (2014) show that a large part of cross-country price differences can be explained by different tax rates, income levels and consumption intensities. Therefore, these three factors may act as confounders in the relationship between market concentration and prices since nationwide variables may affect both variables. As an illustration, were grocery prices in Germany at the same level of the lowest price country in our analysis, the annual savings to grocery purchasers would be on the order of 21.8b euros annually, though this amount is particularly subject to qualifications concerning data accuracy and representativeness of products chosen, and is not intended to represent an indication of gains from more effective competition.

2.7.3 Conclusions

Substantial price differences in the price of groceries are observed across Member States. Our analysis has not revealed a clear link between concentration measured at the national level and prices. This may be due to the fact that competition also (if not mainly) occurs at the local level; and to a range of other confounding factors. However, existing empirical literature that was able to rely on more granular, local data seems to confirm that concentration does matter for prices and other relevant outcomes for consumers (most notably variety). However, concentration at the national level may have other consequences, and most notably it may increase the bargaining power of retailers vis-a-vis suppliers, with the possible adverse consequence of lowering incentives to innovate.

2.8 Cement

Cement is of fundamental importance for the construction industry, being a key input for the production of concrete. Whilst colloquially the terms *'cement'* and *'concrete'* are often used interchangeably, technically the two terms refer to distinct products. Cement is a binder that hardens and holds other materials together. Concrete is an inexpensive and strong basic material made from cement, water and aggregates which is commonly

used in the construction of many different architectural structures and elements, for example: bridges, dams, roads, floors, and ceilings.

The cement industry is predominately a business-to-business industry since most buyers are businesses active at some other level of the construction supply chain: cement is often sold to concrete producers, who in turn sell concrete to construction firms; other buyers of cement include wholesalers and resellers, or producers of prefabricated concrete; in some cases, cement is sold to construction firms directly. The production of cement and concrete is often vertically integrated and mergers between cement and concrete producers have been relatively common over the past 50 years.

This section conducts a descriptive price-concentration study of the European cement industry, but first a general industry background is provided. The descriptive empirical analysis is then conducted using national level pricing data for a sample of 8 Member States, namely: Austria, Denmark, France, Germany, Greece, Poland, Spain and Slovakia. The analysis reveals that there is substantial price variation for cement across countries, some of which may be related to market structure. The reporting level of our data is not sufficient, though, to match pricing to local markets so results must be considered suggestive only.

2.8.1 Industry background and literature

Cement's productive process entails two steps. The first step consists of extracting raw materials (i.e., limestone and clay) and mixing them up with water to obtain a raw mixture called a meal: this is then cooked at high temperatures to get cement clinker. The third step consists of grinding the clinker, together with additional raw materials, to get the cement, a grey powder. The production of cement also generally relies on high energy usage. The product that results from the process described is essentially homogeneous (though customisation features around delivery type and format may yield price differentiation). Cement can be classified in the following categories:

- Portland cement – this is the most common, low-cost, and widely used type of cement worldwide.[235] In 2021, Portland Cement corresponded to more than 60% of total cement deliveries in the EU;[236]
- pozzolanic cement – corresponds to blends of Portland cement with pozzolanic material, which might be natural or synthetic. Natural pozzolanas are mostly volcanic in origin like diatomaceous earth;
- high alumina cement – this is a rapid hardening cement produced by fusing a combination of bauxite (aluminium ore) and limestone in a reverberatory or electric furnace or rotary kiln at 1500–1600°C;
- slag cement – correspond to the glass-like by-product left over after separating a desired metal from its raw ore, and it is generally generated via a blast furnace-oxygen converter method or electric arc furnace.

There are generally three types of cement production sites: integrated cement plants, grinding stations and blending stations.[237] An integrated cement plant is a manufacturing facility that covers the entire cement production process from the mining of raw materials to the dispatching of cement. This includes: (i) raw material extraction or mining from a quarry; (ii) raw material preparation and blending; (iii) raw feed

[235] *For a technical description see https://www.intechopen.com/chapters/79343.*

[236] *Source: https://www.cembureau.eu/media/lfqjyve5/key-facts-figures-2021.pdf.*

[237] *Case COMP/M.7252 – Holcim / Lafarge of 15/12/2014.*

preparation out of the raw materials in the form of meal; (iv) clinker production; (v) grinding and blending of clinker with gypsum or other; and (vi) storage and handling of cement products, including dispatch. A grinding station or grinding mill does not include the mining and the thermal process of producing clinker, but only the final grinding, blending and handling steps, with clinker and other raw materials being delivered from a separate plant or sourced elsewhere.

A blending station is typically a silo-type storage installation with a blending and dispatch facility where the ground products can be received, mixed for homogenisation and quality purposes into the final product and ultimately dispatched.

Cement demand tends to follow the seasonality of the construction business, with peaks in the summer months and reduced activity in the winter months.

The cost of transportation represents a significant fraction of the overall costs. Typically, cement is transported by road (in trucks) but both transportation by rail and sea tend to be cheaper. Hence, when the latter options are not available, the relevant geographical markets tend to be rather local. For example, in the merger decision between Holcim and Lafarge,[238] the European Commission stated that *"[t]he market investigation generally confirmed that most of the cement sales take place within the 150km radii. On average, a cement plant sells approximately around 70% of output within that range, and around 90% within the 250 km radii"*. This reflects the distance up to which cement suppliers can profitably sell cement. Furthermore, *"markets should not be limited by national borders, in light of the significant cross-border trade flows and the views of respondents to the market investigation"*. This indicates that, from the perspective of most individual customers, competition takes place at the local/regional level.

The market structure is typically highly concentrated (oligopolistic) since the business is characterized by high barriers to entry. The investment required to make a new plant (above €150M for a million tonnes capacity) and the associated high costs for modifications hinders any significant short-term adjustments in response to market fluctuations.[239] The production of cement can be capacity constrained by maximum plant outputs. Additionally, cement plants benefit from economies of scale. They are highly automated and governed by rigorous environmental and quality standards, making it more difficult for new entrants to join the market.

Producers generally have the CE mark for cement sold in the European Union. The EN 197-1 Standard lists the criteria that need to be satisfied to be able to produce Portland cement, which may contribute to making barriers to entry high. Notwithstanding, in a decision regarding the EN 197-1 Standard,[240] the European Commission has considered that "*cements not complying with EN 197-1 Standard can have such an access [to the European Market], particularly cements having obtained an ETA. The conformity of cement with the EN 197-1 cannot be therefore considered as a condition sine qua non for the access to European markets. In these circumstances, the EN 197-1 Standard cannot be considered as a de facto mandatory Standard*".

On the surface it appears that both the buyers and suppliers of cement have a degree of bargaining power. On the one hand, customers can easily switch from one supplier to the other. Cement is a standard commodity and branding plays little to no role. For

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[238] Case COMP/M.7252 – Holcim / Lafarge of 15/12/2014, p.17-18.

[239] Source: https://www.cembureau.eu/about-our-industry/key-facts-figures/.

[240] See case COMP/F-2/38.401 EN 197-1 Standard - EMC/European Cement Producers of 28/09/2005, p.14.

example, in the merger decision between Holcim and Cemex West,[241] the European Commission stated that "*switching costs seem rather limited for the majority of bulk cement customers because of the standardised nature of the product*". Equally there may be a degree of interchangeability between types of cement as a merger decision by the Spanish Competition Authority (CNMC),[242] found that, "*certain types of white cement* [a particular type of Portland cement] *are technically suitable for all uses*".[243]

However, it is important to note that certain characteristics of the cement industry (such as product homogeneity, high barriers to entry, and inelastic demand) are conducive to anticompetitive behaviour, and illegal cement cartels have been detected by national competition authorities in at least two Member States. Specifically, in 2003, the Bundeskartellamt imposed fines of approximately €660,000,000 on the 6 largest German cement producers for market allocation, and quota agreements on four regional cement cartels which spanned between the 1970's and 2002;[244] Similarly in 2009, the Polish Office of Competition and Consumer Protection imposed fines of approximately €100,000,000 on seven companies engaged in market sharing and price fixing practices in the Polish grey cement market over a period 11 years between 1998 and 2009.[245]

Additionally, Fink and Frübing (2015) identify legal cartels in Austria and Norway which existed before the advent of modern competition law.[246] Austria operated a legal cartel in the cement industry between 1951 and 1999 which agreed on quotas for each member and fixed prices centrally. Analogously, a legal cement cartel was formed in Norway in 1923 and operated until 1968 when the cartelists merged into a monopoly. The cartelists agreed to divide the market based upon capacity and fixed prices via a common sales office. An agreement also existed to ensure that all excess capacity was generally sold to non-European nations out of fear of retaliation from other European Nations. Hytinnen et al. (2018) find, more generally, that during the period of legal cartels in Finland, the steady state rate of cartelisation was 80-90%. Albaek et al. (1997) found that centralised government reporting of average cement prices in Denmark was followed by price increases.

The United Kingdom has also investigated competitive practices in the cement industry. Following a recommendation by the Office of Fair Trading, the UK Competition Commission launched a market investigation into the aggregates, cement and ready-mix concrete market in Great Britain. The investigation found these adverse market outcomes were due to both structural features,[247] namely:

- high concentration;
- transparency of sales and production shares, wins and losses and customer– supplier relationships;

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[241] *See case COMP/M.7009 - Holcim / Cemex West of 05/06/2014, p. 44.*

[242] *Case C/1052/19: ÇIMSA / ACTIVOS CEMEX of 29/09/2020. Findings were also summarized for an OECD roundtable.*

[243] *Available at: https://one.oecd.org/document/DAF/COMP/GF/WD(2020)13/en/pdf.*

[244] *See Bunderskartellamt press release (2003) 'Bundeskartellamt imposes fines totalling 660 million euros on companies in the cement sector on account of cartel agreements'*

[245] *See European Commission Press Release 'Poland: Cement Cartel smashed'*

[246] *See Fink and Frübing (2005) for a discussion.*

[247] *See paragraph 49 of 'aggregates, cement and ready-mix concrete market investigation: final report, competition commission (2014).*

- high barriers to entry;
- homogeneity of product;
- consumer characteristics and behaviour;
- vertical integration of cement into downstream operations.

The report also identified relevant conduct features (the degree of which varied over time),[248] namely:

- a strategic focus on maintaining market stability;
- 'tit for tat' behaviour used to balance shares;
- price announcement behaviour;
- the use of cross-sales as a mechanism for transparency, signalling and, on occasion share balancing; and
- targeting of importers beyond normal competition on price and service.

While the focus of the current study is on the relationship between market structure and prices, it is important to bear in mind that the price of cement depends on a variety of supply and demand factors. Some of these may be suggestive of intense rivalry while others, such as product homogeneity and binding capacity constraints, contribute to creating conditions for implicit coordination or explicit cartelisation. In fact, some observers, such as Madio and Pugnataro (2023) or Harrington (2021), consider cement as the prototypical cartel industry, based on an extensive history of cartel activity.

The main determinants of the price of cement are the following:

- the level of demand, which is largely determined by the economic cycles. The demand for cement is highly inelastic to its price, which is also highlighted by the European Commission (case COMP/F-2/38.401).[249] As explained above, the demand for cement mostly comes from concrete producers: for their purposes, cement has no substitutes. The demand faced by concrete producers is, in turn, inelastic to the price of concrete: construction activities are complex and require a variety of inputs. Concrete, which is characterized by a low degree of substitutability with other construction materials, is only one of these inputs. This suggests that the price of concrete (which is, in part, the result of the price of its main input, cement) is very unlikely to determine the decision to start a construction project or not. The economic literature confirms this feature of the demand for concrete. Collard-Wexler (2013) considers it unreasonable that the price of concrete can influence the volume of activity in the construction sector, given that concrete represents only a small portion of construction costs; in particular, he considers that the volume of activity in the construction sector is an exogenous variable with respect to the price of concrete. Similarly, according to Syverson (2004),[250] it is unlikely that a shock in the concrete industry (e.g. a reduction in prices) would translate into a boom in construction activities;
- the price of inputs, and in particular raw materials (clay and limestone), fossil fuel and electricity. A JRC study (2016) found out that energy costs, labour and salaries, and raw materials account for two-thirds of the overall production costs;

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[248] See paragraph 50, 'Aggregates, Cement and Ready-mix Concrete Market Investigation: Final Report, Competition Commission' (2014).

[249] La Cour and Mollgaard (2002) suggests a demand-price elasticity coefficient of -0.27 and Demailly and Quirion (2006) assumes a value of -0.2.

[250] Syverson, C. 2004. Market structure and productivity: a concrete example. Journal of Political Economy, 112(6), 1181-1222

- transportation costs (described above). The JRC study (2016) reported a transportation cost of EUR 10 per tonne of cement per 100 km by road and around EUR 15 per tonne to cross the Mediterranean Sea, subject to availability of dedicated loading and unloading infrastructure in ports.[251]

To the extent we do not find a compelling relationship between national concentration (even if based on local/regional estimates) and national pricing, part of the explanation may arise from unobserved conduct, as well as from data limitations (notably as regards pricing – cf. next subsection).

2.8.2 Data and outcomes

The main objective of this section is to explore whether concentration affects prices. This is done through a descriptive cross-country comparison of concentration and prices. To perform the analysis, we collect information on the main outcomes for the cement industry at country and regional level. Cement markets are typically regional, but unfortunately sufficient regional data on cement prices are not available. The focus of the data analysis is thus very much determined by the type of data that was available to the team, recognising that it is not perfect for the purpose of analysis.

The following Member States have been selected for this exercise: Austria, Denmark, France, Germany, Greece, Poland, Slovakia and Spain. They are intended to illustrate a variety of industry conditions and geographic differences within the EU.

To check whether a correlation between prices and concentration is observed, the following data have been collected:

- prices: national level cement price data was not directly available. While Eurostat provides a price index for cement, it does not allow us to do a meaningful comparison among Member States as prices are indexed to 100 in 2015 for each Member State, regardless of any initial price country differences. We overcame this issue by using other Eurostat cement data, namely data on sold production, exports and imports[252] which was used to calculate average domestic and import price for Portland cement in each sample Member State.[253, 254, 255] Even so, the price data remain national in scope.

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[251] *This ordering of cost between road and waterborne transport may be inconsistent with other sources cited, due, perhaps, to differing sources of data.*

[252] *Available at https://data.europa.eu/data/datasets/ajlhydn9s1p8lwpbqlrka?locale=en.*

[253] *The Database provides information on quantities produced, imported and exported (in Kg) by country for Portland cement, as well as the total value (in €) of the quantity produced, imported and exported. To calculate the average domestic price (i.e., the average price of Portland cement sold within each country) we divided the value of the quantity produced and used by each country (given by the total value of quantity produced minus the total value of quantity exported) by the quantity produced and used by each country (given by the total quantity produced minus the quantity exported). Equally, this database also allows to compute import prices, i.e., the price that companies pay for imported cement, by dividing the value of quantity imported by the quantity imported. However, it is worth highlighting that Note that, since the underlying data comes from the database "External Trade Statistics," the calculated average price includes transportation costs which may vary across Member State due to geographic differences.*

[254] *Available at: https://data.europa.eu/data/datasets/ajlhydn9s1p8lwpbqlrka?locale=en.*

[255] *Available at: https://www.ecb.europa.eu/stats/balance_of_payments_and_external/external_trade/html/index.en.html.*

- Emissions of carbon dioxide by each company as a proxy for the cement production, that can be used to compute a concentration index.[256] Furthermore, we collect the latitude and the longitude of European cement companies to get a local concentration index in a radius of 250km around each company. Then, we compute the average concentration index for each country. This approach allows us to produce a national concentration level that is broadly reflective of local conditions. Concentration at the national level still provides a meaningful indicator of competition and can be matched with the geographic area of price data, which is national.

To better understand the price differences amongst countries, we look at the cost evolution of its main determinants: limestone, clay, energy, and transportation. For limestone, clay and clinker, data were retrieved from the same database as cement and the same methodology was applied.[257] Energy prices are directly available from Eurostat. We looked at electricity prices for non-household consumers (with all taxes and levies included).[258] Regarding transportation, we used a transport cost index from Eurostat, as no direct cost measure seems to be available.[259] Table 2.9 shows the input cost for the sample countries. In 2020, France displays the highest cement price per kilogram, while Poland displays the lowest price per kilogram. However, price differences do not seem to be explained by differences in input costs. Indeed, even though Spain displays the lowest prices for input materials, the cement price is higher than the ones of some other countries displaying higher costs for input materials. The evidence from Table 2.9 suggests that prices are not strongly correlated with the input costs.

[256] *Information from* https://www.cemnet.com/global-cement-report/ (The Global Cement Report™, 13th Edition, accessed 14/01/21).

[257] *See following hyperlinks for data sources:*
Limestone:https://ec.europa.eu/eurostat/databrowser/bookmark/3668f8d5-d7e9-47c9-90de-4dccfb325276?lang=en
Clay:https://ec.europa.eu/eurostat/databrowser/bookmark/6f49bfd1-b9ce-4adb-a598-b687f95104f9?lang=en
Clinker:https://ec.europa.eu/eurostat/databrowser/bookmark/4507ca97-aae0-4cf1-a5e3-d8c1e29ed2fb?lang=en

[258] *https://ec.europa.eu/eurostat/databrowser/bookmark/8cb1afee-d920-4f6e-8a24-7e48dfbf4b75?lang=en*

[259] *https://ec.europa.eu/eurostat/databrowser/view/prc_hicp_aind__custom_7868699/default/table?lang=en*

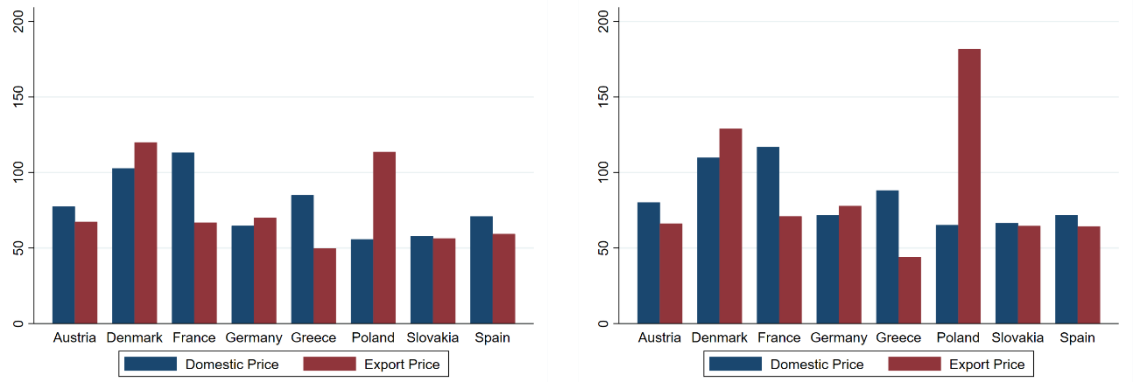
Table 2.9: Main cost determinants of cement in 8 Member States

Country	*Cement Price (2020)*	*Clay price (2018)*	*Limestone price (2020)*	*Energy price (per Killowatt-hour) (2020)*	*Transportation index (2020)*	*Clinker price (2020)*
Austria	.080	.065	.005	.142	102.82	.057
Denmark	.110	.124	.025	.235	102.1	.
France	.117	.054	.01	.114	105.2	.
Germany	.072	.	.014	.218	104.7	.04
Greece	.088	.	.01	.112	102.35	.035
Poland	.065	.	.009	.132	101.5	.039
Slovakia	.066	.37	.008	.158	101.77	.
Spain	.072	.001	.005	.142	101.81	.03

Source: Project Team based on PRODCOM (Eurostat)

Figure 2.34 provides information on prices for 2015 and 2020. Four main findings emerge: (i) there seems to be no large difference between the 2015 and 2020 prices within each country, apart from France which saw its price increase almost 40%. In 2020, the French domestic price per tonne is almost twice as high the one in Poland, the country with the lower price, and almost 50% higher than the average price of the other seven countries); (ii) the Polish export price is twice its domestic price in 2015, and three times higher in 2020. In 2020, the Polish export price was four times higher than the Spanish price (the country with the lowest one) and 2.5 times higher than the average export price of the other seven countries. Denmark also has a higher export price – around 20% higher than domestic price; (iii) there is no significant variation in prices (between domestic and export prices) for Germany, Slovakia and Spain; (iv) the domestic price for Austria, Greece and France is higher than their export prices. This is particularly relevant for France, where the domestic price is around half the export price for 2020.

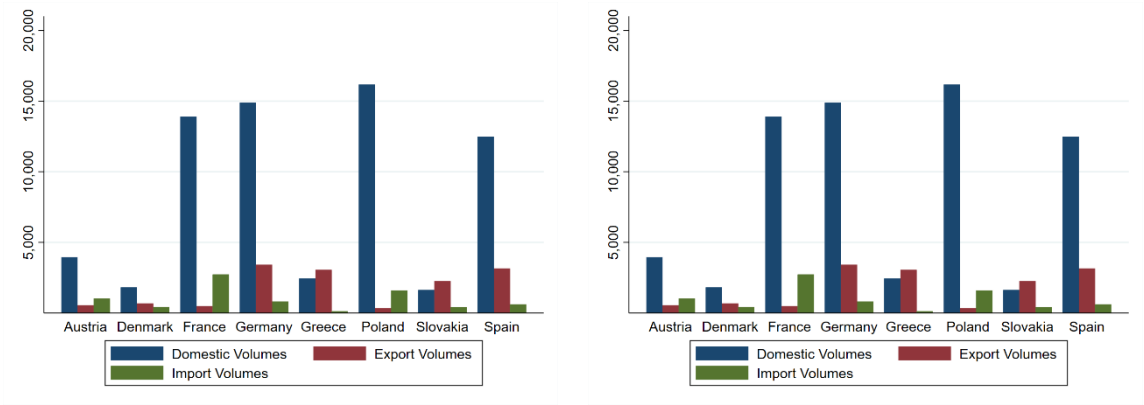
Figure 2.34: Domestic and export Portland price cement (€ per tonne) in 2015 (left panel) and 2020 (right panel)



Source: Project Team based on data: PRODCOM data (Eurostat)

Figure 2.35 provides information on the total amount (in '000 tonnes) of (Portland) cement produced, imported and exported for the different countries in 2015 and 2020. There are two major points worth highlighting: (i) the bottom four countries by cement production in volume (Slovakia, Denmark, Austria and Greece) seem not to have significant imports; and (iii) while Slovakia seems to export everything it produces, Poland is consuming almost everything it produces.

Figure 2.35 Portland cement (in '000 tonnes) in 2015 (left panel) and in 2020 (right panel)



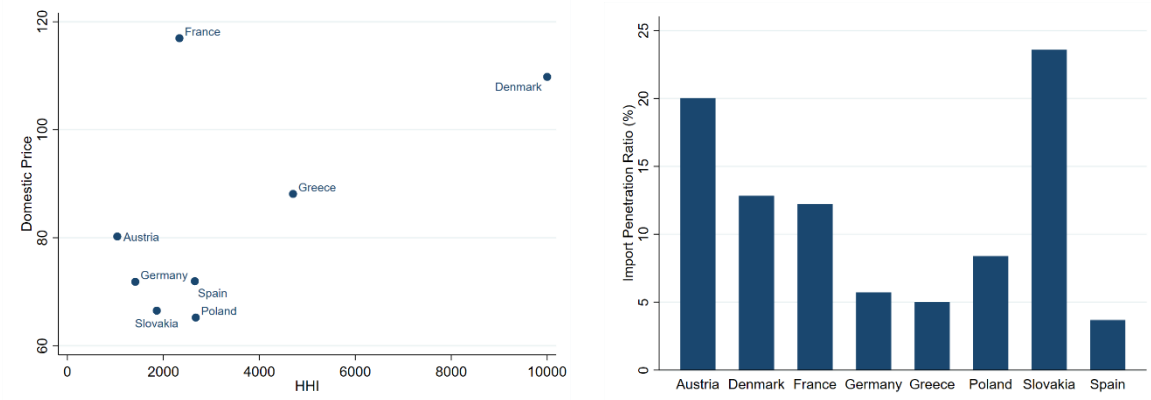
Source: Project Team based on data: PRODCOM data (Eurostat)

Figure 2.36 shows the relationship between the HHI, measuring market concentration, and the domestic price in the left panel and the import penetration ratio in the right panel across countries in 2020. Overall, a weak association between market concentration and domestic price appears. Denmark and Greece have particularly concentrated cement markets and also relatively high prices. France, which is another high price country, has a HHI (based on averages of local markets) that is considerably higher than its simple national average by producer, due to producers in France having a relatively strong regional focus, and Slovakia's HHI (based on the averages of local markets) is considerably lower than otherwise, particularly due to its proximity to foreign producers.

Miller et. al. (2023) reported similar results for the United States. Using data between 1974 and 2019, the authors conducted an empirical analysis to study the relationship between concentration, markups, and prices. While concentration (measured by HHI) and markups have increased over time, prices seem to be somehow stable. The reported correlation between HHI and prices is positive but very weak (0.127). The main explanation behind this result is the development of a new technology called precalciner technology, "*which lowered the marginal cost of production and significantly increased plant-level capacities, thereby contributing to an industry shakeout in which many plants closed*" (Miller et. al., 2023, 39).

However, a market concentration index based on national facilities may lead to an incomplete assessment of how competitive a market is since imports may exert significant competitive pressure on domestic producers. Therefore, we move to analyse the import penetration ratio to understand whether and to what extent market power by domestic producers may be kept in check by imports. The right panel in Figure 2.36 shows the country-specific value of import penetration ratio.

Figure 2.36: HHI and domestic price (left) and import penetration ratio (right) for 8 Member States in 2020



Source: Project Team based on PRODCOM (Eurostat) and https://www.cemnet.com/global-cement-report/ (The Global Cement Report™, 13th Edition, accessed 14/01/21)

France shows a high import penetration ratio while at the same timehe domestic price is the highest among the sampled countries. The explanation may stem from the further certification, NF Certification, required in tenders for public works.[260] A further certification for public works raises the entry barriers of foreign firms to compete in the same market of domestic firms leading to an increase in the domestic cement price. France is not the only country to require further certification by cement producers. The Concrete Sustainability Council Certification in Europe and the DS/EN 206 in Denmark provide a barrier to foreign competitors to enter the cement market. Germany, the main country hosting firms holding the Concrete Sustainability Council Certification, shows a low import penetration ratio, while Denmark shows a high import penetration ratio. The difference between two countries might stem from the strict requirements to obtain the certification. Greece's low import penetration ratio might stem from its relative geographic distance to other European countries and potential practical constraints related to import facilities availability. As an illustration, were cement prices in France at the same level of the lowest price country in our analysis, the annual savings to cement purchasers would be on the order of 770m euros annually, though this amount is subject to qualifications concerning data accuracy and is not intended to represent an indication of gains from more intense competition.

2.8.3 Conclusions

The prior discussion has explored and found information related to possible structural factors, such as concentration, that may affect pricing. Substantial price differences are observed between Member States. Our cross-sectional analysis between domestic prices and market concentration does not show a strong correlation. The main explanation is that cement markets are local in geographic scope and do not follow national borders since the European cement certification allows all EEA based cement producers to sell their product throughout the EEA. France has a stricter regulation on tenders for public works since it requires a double certification. Indeed, the French domestic price is the

[260] *In case COMP/M.7252 – Holcim / Lafarge, two thirds of customers that responded to the market investigation indicated that the NF mark limits the capacity of importers to compete effectively.*

largest among the sample countries. The distance and the high cost of shipping cement does not allow other importers to be competitive in the Greek market.

2.9 Conclusions

After decades of economic integration across EU Member States, prices of similar goods still vary substantially across the EU. This phenomenon is not unique to Europe. We have documented that prices can be even higher in some sectors in the US than in the EU, such as with mobile telecom services, which confirms findings reported in Philippon (2019). We have looked at possible origins for this phenomenon of price differences.

One possible explanation would be cost differences between countries. Cost differences could, for example, originate in raw material costs, transport, or scale and scope. But after focusing on a number of different sectors, we have seen that cost differences in the EU do not seem to fully explain the price differences.

Economic theory and the empirical literature suggest that, in many cases, there may be a relationship between market or industry concentration and price. This relationship tends to suggest that markets with less competing firms have higher prices. Despite persistent antitrust enforcement across the EU over decades, substantial variations in concentration remain. These are documented here for a sampling of countries that are geographically diverse and with price differences. These concentration differences may be due, in some part, to persistence of ownership patterns by companies over long periods of time.

For a number of other sectors, which were chosen to illustrate a cross-section of economic activity, we perform more qualitative comparisons, while still examining relevant price and concentration data. The sectors examined include beer, mortgages modern consumer retail and cement. Due to the lack of causal analysis in the qualitative studies, much care is needed to avoid over-interpreting the associated results. Having said that, we do not find strong evidence that cost differences would substantially explain the price differences observed across EU states. Some of the higher price markets, e.g. in France for cement, appear to have regulation (via standards) that differ from other countries examined. Overall, the concentration and price data from the sectors examined, which represent important but partial views of sectors overall, is generally consistent with the view that market structure could be related to price differences.

We perform detailed analyses of mobile telecom and airline pricing that confirm that prices are positively related to the level of concentration. We find higher concentration associated with lower investment, based on the example of mobile telephony.

On balance, economic theory, prior empirical work and our own analyses support the idea that, all other things being equal, higher market concentration is associated with higher prices. To the extent that our findings are generalisable across other industries, they confirm that the trends of rising concentration described in chapter 1 of this study should be a reason for concern.

3 Global Superstars

Economists usually study representative agents or firms, i.e. agents or firms that are in many ways like most others. But in some cases — especially when the distribution is skewed and some agents or firms attract much more business or attention than others — it is also important to explore what happens at the tail of the distribution and focus on some extreme cases. This chapter of the report takes this approach and looks at the most profitable firms amongst the firms that generate the largest revenues, which we refer to as *Global Superstars*.

Superstars have been the subject of economic studies for decades. Sherwin Rosen wrote a famous article in 1981 entitled "The Economics of Superstars". He summarizes the role of Superstars in the first paragraph of this article as follows: "The phenomenon of Superstars, wherein relatively small numbers of people earn enormous amounts of money and dominate the activities in which they engage, seems to be increasingly important in the modern world. […] In certain kinds of economic activity there is concentration of output among a few individuals, marked skewness in the associated distribution of income and very large rewards at the top".

The skewness of the distribution of firms' turnover and profits makes it key to study firms at the extreme of the distribution. The skewness of firm distribution is illustrated as follows by De Loecker et al. (2022)[261] for UK firms: "In the UK, only 0.1% of businesses have at least 250 workers, but in 2019 these companies accounted for almost two in five of all jobs and just under half of aggregate turnover." While these metrics differ across countries, the firms at the tail of the distribution of turnover and profit represent an important part of goods and services produced, value added and jobs in all countries.

Our work is related to *Superstar firms*, although Global Superstars do not necessarily coincide with Superstar firms. Indeed, Superstar firms can be large on their respective markets without being among the most profitable of the world's largest firms[262]. The rise of Superstar firms can be the outcome of two (not necessarily mutually exclusive) processes. The rise of Superstar firms could be the outcome of the evolution of the economy, with globalisation and technological innovation contributing to the spread of "winner takes all" or "winner takes most" dynamics in many sectors; alternatively, the rise of such firms could be attributed to "malign" causes, such as regulatory barriers to entry and the increase of market power combined with anti-competitive business strategies by firms. Arguably, if the growth of Superstar firms stems from lax antitrust enforcement, there is a need for stricter competition enforcement. But, even if they enjoy market power due to them being winners of a competitive process, Competition Authorities still may need to act to protect consumers. For instance, Shapiro (2019) argues that mergers involving Superstar firms that have become successful through pro-competitive means are more likely to lessen competition and harm consumers. As a consequence, with Superstar firms gaining large market shares, by responding efficiently to changing economic conditions, there may be a need for stronger antitrust enforcement.

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[261] *De Loecker, J., Obermeier, T. and Van Reenen, J. (2022), "Firms and inequality", IFS Deaton Review of Inequalities.*

[262] *For instance, when the product or geographic markets where a Superstar firm is active, the Superstar firm can be larger than other firms on the market (so large relative to other firms), while being relatively small in absolute terms. Global Superstars, in contrast, are the largest and most profitable firms in the world in absolute terms.*

This chapter is organised as follows. After a review of the literature, we provide a definition of "Global Superstars" and identify them based on this definition. We thereafter characterise the Global Superstars and the sectors where they are most commonly found and explore the nature of barriers to entry from which Global Superstars may benefit, assessing in particular whether their business strategies have contributed to create new barriers to entry or increase existing ones.

3.1 Literature review

As explained in chapter 1, over the last decades, a number of studies have pointed to increasing concentration, increasing markups (the degree to which prices exceed marginal cost) and reduced dynamism, first in the United States and then globally.[263] One proposed explanation is the rise of Superstar firms (note that Superstar firms are the most profitable firms in their sector, but are not necessarily Global Superstars, which we define as the most profitable of the world's largest firms).

Currently, there is no commonly agreed definition of Superstar firms or unique methodology to identify them. Different criteria and features have been proposed and tested in the literature. One hypothesis, expressed in the seminal papers of Autor et al. (2017; 2020), is that changes in economic conditions such as globalisation and technological progress have favoured firms with superior quality, lower costs or greater innovation (Superstar firms). Following this change in economic conditions, these firms are reaping disproportionate rewards relative to prior eras. According to the authors, since these firms have higher markups in sales and value added, their gain in market shares across a range of sectors has led to higher markups and concentration in a wide range of industries. In other words, the increase in markups is primarily due to a reallocation of sales and value added to (Superstar) firms with high markups, rather than to an increase in markups within firms. Or, in more technical terms, a composition effect within industries, whereby increased competition favours firms with higher markups.

In a 2018 discussion paper by McKinsey Global Institute, Superstar firms are defined as firms that have a significantly greater share of global economic profit[264] than other firms. From McKinsey's database of 33,000 firms, 5,750 firms that have a combined 2/3 share of global revenue and pre-tax profit are identified and the top 10% of these firms in terms of economic profit are classified as Superstar firms. The authors show that the gap between Superstar firms and the average firm has grown since the late 1990s, as has the gap between the firms in the lowest decile of economic profit and the average firm.

Our review of the economic literature on Superstar firms will focus on the following aspects: (i) the economic effects of the increased prevalence of Superstar firms (section 3.1.1); (ii) the underlying causes of their increased importance (section 3.1.2); and (iii) the sectors where these firms are present and/or are emerging (section 3.1.3). After the review of the main papers, a new comprehensive definition of Global Superstars is proposed (section 3.2).

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[263] Influential studies documenting increased concentration include (CEA, 2016) , and (Gutiérrez & Philippon, 2017) (Grullon et al., 2019)

[264] In this paper, Economic Profit = Invested capital(Return on invested capital – weighted average cost of capital)*

3.1.1 The effects of the rise of Superstar firms

The literature on Superstar firms originates in the literature that has documented socio-economic changes observed in rich countries such as higher industry concentration, higher markups and increased wage inequality. The effects of the rise of Superstar firms are therefore not very different from the effects of other papers in this broader literature, which can be summarised as follows: rise in productivity inequality between firms, higher aggregate markups, a growing dominance of big companies, a fall in the labour share of GDP and a in decline in business dynamism.

One consequence of the rise of Superstar firms is an increase in average markups. These higher markups are caused by the higher market shares of (high markup) Superstar firms and the associated decrease of the portion of the market served by lower markup firms. De Loecker et al. (2020) find that there has been a rise in markups in the U.S. since 1980 and according to their study this is driven by a reallocation of turnover within industries to firms that have relatively high markups (with most firms' markups remaining at the same level, consistent with the Superstar firm pattern).

Higher markups can derive from higher prices or lower cost (or a combination of both). Some recent papers try to disentangle these two effects for specific industries. For consumer products[265], cement[266], wholesalers[267] and steel[268], these papers find that prices have been stable over the period studied, and that the increased margins are mainly caused by lower costs. But for automobiles[269] it seems that prices have increased. An aggregate study by Conlon et al. (2023) suggests that across industries higher markups are mainly caused by lower costs (rather than higher prices).

Autor et al. (2020) describe another effect of the rise of Superstar firms, namely the decrease in the labour share of GDP. They argue that this is the result of a reallocation of the economic activity from firms with higher labour share to Superstar firms where markups are higher and the share of value added going to labour is lower. They suggest that the rise of Superstar firms and the fall in the labour share relates to increased reliance on domestic outsourcing by large firms, whereby several activities previously done within the firm are increasingly externalized (this effect primarily affects lower paid jobs). The authors argue that this can reduce the labour share by reducing the number of workers that benefit from being employed by Superstar firms.

Azar et al. (2022) analyse the rise in concentration of employers in local labour markets in the U.S. The paper focusses on the most frequent occupations on an employment website. The authors document a negative correlation between labour market concentration and average posted wages in the market. In other terms, they find that a reduction in the number of employers is associated with lower advertised wages.

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[265] *Döpper, H., MacKay, A., Miller, N. and Stiebale J., (2023). "Rising Markups and the Role of Consumer Preferences". Harvard Business School Strategy Unit Working Paper No. 22-025, Georgetown McDonough School of Business Research Paper No. 3939126.*

[266] *Miller, N., Osborne, M., Sheu, G. and Sileo G., (2023). "Technology and Market Power: The United States Cement Industry", 1974-2019. Georgetown McDonough School of Business Research Paper No. 4041168.*

[267] *Ganapati, S. (2018). "The Modern Wholesaler: Global Sourcing, Domestic Distribution, and Scale Economies," Working Papers 18-49, Center for Economic Studies, U.S. Census Bureau.*

[268] *Collard-Wexler, A., De Loecker, J. (2015). "Reallocation and Technology: Evidence from the US Steel Industry." American Economic Review, 105 (1): 131-71*

[269] *Grieco, P., Murry C. and Yurukoglu, A., (2023). "The Evolution of Market Power in the Us Auto Industry". NBER Working Paper No. w290137*

A commonly addressed question in the economics literature is the effect of increased industry concentration on innovation (see section 1.1.1).The rise of Superstar firms could have a negative effect on innovation, if established Superstar firms with technological advantages over non-Superstars, do not face the competitive threat required to incentivize further innovation.

Aghion and Howitt (2022) develop this idea and argue that Superstar firms could also reduce innovation strategically, by using their power to create barriers to further innovation that threatens their positions. The firms that successfully disrupt industries with new innovations then become incumbents themselves and the rewards of previous innovation can be later used to finance the suppression of innovation and growth. The authors also suggest that incumbent firms can deliberately suppress innovation through strategic innovation and patenting, pre-emptive mergers, and lobbying for regulations that hinder potential rivals. The rise of Superstar firms can thus contribute to a decrease in business dynamism, as the productivity growth of less productive firms has fallen, while entry of firms has decreased (see section 1.3).

Akgit et al. (2021) underline that the rise in market power is persistently concentrated among a small group of firms. The lack of churn among powerful firms, they argue, is associated with a decline in business dynamism and a falling share of economic activity accounted for by young firms. Similarly, Akgit and Ates (2023) study the slowdown in business dynamism as a consequence of rising market concentration using a calibrated general equilibrium model. They highlight the decline in the intensity of knowledge diffusion in the economy, and focus in particular on the role of market leaders and followers. Market leaders try to innovate in order to increase their markups and profits, while followers try to innovate to leapfrog leaders. They argue that followers (and entrants) are increasingly discouraged by markets dominated by leaders.

So while some recent papers point to a decrease in social welfare related to the rise in markups, Autor et al. (2020) argue that the rise of Superstar firms is the market response to economic developments such as technological progress and globalization. According to them, these changes are accompanied by productivity growth, suggesting that social welfare would not necessarily be higher if Superstar firms were more fragmented.

3.1.2 The causes of the rise of Superstar firms

The economic literature identifies multiple causes for the rise of Superstar firms. They are generally seen as a natural outcome of the competitive dynamics of markets, whereby Superstar firms gained market power after out-competing other firms on the market. The underlying causes of the increased competition on the market that enable more competitive firms to outcompete rivals are detailed in section 3.1.2.1: they include improved search technologies, the development of international trade and globalisation, the increased importance of intangible capital and the diffusion of robotization.

Some papers argue that Superstar firms prosper through anticompetitive behaviours and/or entry barriers. Accordingly, Superstar firms gain market power because of anti-competitive strategies, or by taking advantage of regulatory policies, or because of the underenforcement of antitrust laws by Competition Authorities. This second line of reasoning (which is not incompatible with the first line of argument) is detailed in section 3.1.2.2.

3.1.2.1 Superstar firms as winners of the competitive process

More intense competition

Autor et al.'s (2020) theoretical model uses the minimum level of efficiency a firm needs to reach to compete in a market as a measure of how competitive a market is. When competition in a market increases, there are two main effects: a within-firm effect where

individual firms' markups decrease (because of increased elasticity of consumer demand, firms are less able to raise prices above costs) and a between-firm effect where sales are reallocated to higher performing firms with higher markups who are better able to compete in more competitive markets. Under some conditions about the distribution of productivity levels across firms, the between-firm effect will be stronger than the within-firm effect and increased competition will lead, on average, to higher markups and higher market concentration.

Autor et al. (2020) suggest that an increase in the "toughness" of competition in various sectors has favoured firms who produce higher quality products, are more innovative and/or have lower costs. These firms can increase their market shares at the expense of their weaker competitors. The causes of increased toughness suggested by the authors include improved search technologies, which could lead to consumers becoming more sensitive to quality-adjusted prices, and greater product market competition following globalization (see hereunder). According to the authors, the mechanism of "winner takes most" resulting from their model could also be explained by the growth of platform competition in many industries or by the scale advantages related to the growth of intangible capitals and advances in information technology ("IT").

Investment in proprietary IT

Bessen (2020) argues that instead of levelling the playing field between small and large firms, IT has increased the advantage of large firms because they are able to use it more effectively. The paper also provides empirical evidence of the comparative advantage of large firms in using IT developments. The author finds that the increasing concentration of U.S. markets can be largely explained by the increased use of proprietary IT, and that proprietary IT has disproportionately benefitted the top four firms across multiple industries.

Van Reenen (2018) also suggests that recent falls in the quality-adjusted prices of IT goods could be disproportionately benefitting large firms who can invest more in IT and utilise IT goods more effectively. For example, large retailers have been able to develop software to make their logistics and inventory systems more efficient increasing their advantage over smaller retail chains and independent retailers.

Brynjolfsson et al. (2023) show that increased IT intensity results in increased firm size and sales and increased concentration both in terms of employment and turnover, with the effect on turnover being more pronounced. Consistent with James Bessen's findings, their results show that industries with larger increases in IT intensity experienced faster increases in concentration. The authors conclude that the use of IT has made replication of business processes cheaper and allows for larger and more productive firms to implement their business model to a large number of markets, when a more effective way of performing a task is found, it can be repeated more easily, and the costs of expanding into new industries and markets decreases.

Crouzet and Eberly (2019) give the example of business processes such as online order systems that are increasingly relevant and are scalable, meaning that they can be replicated on a large scale at low costs, and can be subject to intellectual property rights. They argue that such processes create barriers to entry and economies to scale.

Investment in other intangible assets

Related to the role of IT investment, a popular explanation for the rise of Superstar firms is based on intangible capital—i.e. non-physical assets such as patents, brands and knowledge. One relevant strand of the economics and business literature preceded the current interest in Superstar firms. John Sutton (1991) explains that some sunk costs—costs that cannot be recovered once a firm has incurred them—are "endogenous" in the sense that they are chosen by firms, which can thereby influence their own price-cost margins. According to this influential paper, firms can use their investments

strategically to foster or deter competitors' entry. Examples of such endogenous sunk cost include investment in intangible assets, such as advertising and in research and development ("R&D").

Covarrubias et al. (2020) and Crouzet and Eberly (2019) point to multiple channels through which increased use of intangible capital can lead to higher market concentration. These include increased returns to scale, the creation or reinforcement of barriers to entry and greater price sensitivity of consumers who use technologies such as online price comparison websites, redirecting them to larger, more efficient firms. They note that to the extent that the accumulation of intangible capital has fixed costs and/or reduces the marginal costs of production, this accumulation causes increasing returns to scale.

Tambe et al. (2020) focusses on the relation between digital intangible capital[270] and Superstar firms. They find that the digital intangible capital required to adopt new technologies (such as training and management practices) has been disproportionately accumulated by firms in the top decile of market capitalisation. The authors show that differences in digital capital predict differences in output and productivity.

Other researchers study the effect of specific technological advancements on the rise of Superstar firms. Stiebale et al. (2020) investigate the effect of robotization on the distribution of sales, productivity, markups and profits in the European manufacturing sector. They argue that the use of industrial robots has accelerated the rise of Superstar firms. They conclude that robotization has increased productivity, profits and markups of firms with initially higher productivity and profits, but it has had an insignificant or negative effect on productivity, profitability and markups of other firms. According to the authors, possible explanatory factors include not only the slower take up of new technologies among less productive firms, but also the better ability of workers in more productive firms to adapt to new technologies.

A related mechanism that could explain the rise of Superstar firms relates to overhead labour cost. If this cost component is fixed, larger firms can spread fixed overhead labour costs over more units, resulting in a lower share of labour costs. Stiel and Schiersch (2022) test this hypothesis empirically using German firm-level data, but do not find empirical evidence for this mechanism. The authors therefore conclude that excessive markups are a more plausible explanation.

Globalisation

In an early contribution, Melitz (2003) shows that when there are fixed costs to enter export markets, then only the more efficient firms can benefit from an increased trade openness of a country. Consequently, industries appear more concentrated on a national level because more efficient firms become bigger, primarily because they compete with the other highly productive firms in their industry globally and, increasing concentration at the national-industry level.

Another early contribution is Sutton (1991), where the author studies the relationship between the size of a market and the level of market concentration, whereby endogenous sunk costs cause market structure changes when market size increases, for instance when markets become more global. In Sutton's model, because of endogenous sunk costs, the number of firms does not necessarily increase when the size of the market increases. The number of firms can sometimes decrease because the

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[270] The authors define digital intangible capital as firm inputs that complement IT investments like computer hardware and software. Examples include the development of the business processes needed for new IT systems to be used, and the specific skills needed to use a firm's IT systems.

sunk costs a firm needs to incur to compete in the market grows with market size as firms try and outcompete each other on advertising and R&D.

Thomas Philippon explained at an event[271] in Brussels that globalization has had a spectacular effect on Superstar firms. Referring to the U.S., he argued that the largest firms' domestic turnover has remained reasonably constant over the last decades, but their foreign operations have expanded sharply. As a consequence, the bulk of the increase in turnover and profits of the largest U.S. Superstar firms relates to exports and globalization. He cited the example of the domestic operations of Apple, which are not more important than AT&T's a couple of decades ago. But Apple's global turnover is significantly more developed than AT&T's was.

Specialisation

Another possible cause of the rise of Superstar firms is an increase in firm specialisation, defined as the number of industries a firm is active in according to US Economic Census data. Ekerdt and Wu (2023) devise a theoretical model and provide empirical evidence that a reallocation of production to more specialised firms has caused increased concentration within 6-digit NAICS U.S. manufacturing industries. Similar to Autor et al. (2020)'s hypothesis that consumers have become more sensitive to quality-adjusted prices, specialisation leads to a reallocation to high performing firms: the reasoning relies on the fact that quality is a luxury so consumers' demand for high quality goods increases with income. Assuming that more specialised firms produce higher quality goods, increasing income levels should lead the demand to shift towards more specialised firms. Ekerdt and Wu (2023) show that over the last 40 years, specialised firms have become more represented in the top four largest firms in various industries and that an increase in the market shares of specialised firms can explain the rise in concentration in U.S. manufacturing industries.

On the other hand, Hoberg and Phillips (2022) also explore the role of firm scope in the evolution of firm size and market structure in the U.S. and find that U.S. firms have expanded the scope of their operations in the past 30 years. Firm scope is measured using text-based analysis of the annual reports of publicly traded US companies to determine how many product markets they are active in. They show that this scope expansion was achieved primarily through acquisitions and R&D expenditure and that this effect diminishes with firm size. This would suggest that any divergence of the largest firms in terms of market value over the past decades is not driven by expansion into new sectors.

Conclusion

The economic literature presents multiple key drivers to explain the rise of Superstar firms. The importance of intangible capital, technological advances like robotization—but also other factors not reviewed in this section, like direct and indirect network effects due to the success of platform industries—are features that are most likely to favour Superstar firms in the future. On the other hand, recent events like the spreading of the COVID-19 pandemic and the conflict in Ukraine are likely to change the impact and magnitude of other factors like globalisation and international trade.

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[271] Philippon made this point at the Antitrust Regulation & the Political Economy conference in the talk "Market Power in a Post Neoliberal World" conference in Brussels, Belgium on March 2nd 2023. Available on YouTube https://www.youtube.com/watch?v=SDaXG1cvT5M&list=PL6donUUMgWnXcX01x2Oevwp23BFfrIlmV&index=7

3.1.2.2 Superstar firms as result of an anticompetitive process

The observed rise in industry concentration and margins and the divergent performance of Superstars and other firms can also be caused by the presence of barriers to entry that reduce the contestability of markets, and/or anticompetitive behaviours may have helped larger firms to reap a greater proportion of turnover and profits. In principle, these anticompetitive forces (at large) can be favoured by a wide range of factors, including regulations or government policies that are not procompetitive (or favour larger companies), legal conducts that decrease head-to-head competition or raise barriers to entry for competitors and anticompetitive behaviour. Only a full-fledged competition investigation can therefore identify the most effective policy instrument to instigate more competition.

Gutiérrez and Philippon (2017) find evidence from U.S. data that firms have increased their market shares because of entry barriers created by government regulations. The authors compare concentration in industries with different levels of regulation and find that there were large increases in concentration in industries where regulation increased, providing support for the barriers to entry explanation of increased concentration.

Andrews et al. (2016) also find support for the hypothesis that increased concentration is driven by unhelpful government policies, showing that in industries where there have been fewer pro-competitive economic reforms there is a greater divergence in productivity between Superstar and non-Superstar firms.

Van Reenen (2018) suggests that increasing differences between firms should not be attributed primarily to policy changes such as reduced antitrust enforcement. The author argues that institutional and policy changes in antitrust and regulation have varied internationally, giving the example of the U.S. and the EU, while divergence in the performance of firms has been growing globally, including in both the U.S. and the EU. The implication of this is that growing differences between firms, in terms of productivity and size, result from fundamental economic changes such as import competition and technological progress, rather than country specific institutional/policy changes.

Covarrubias et al. (2020) estimate the extent to which changes in industry concentration in the U.S. in the past 30 years have been driven by entry barriers, increases in the elasticity of substitution and technological change. They find support for concentration being driven by increased elasticity of substitution and by technological change in the 1990s, and since 2000 there is evidence of decreased competition and increased barriers to entry causing rising concentration.

Autor et al. (2020) argue that firms becoming better at lobbying and creating entry barriers is not a complete explanation of rising concentration, since the industries where concentration has grown are those that have been increasing their innovation most rapidly. An alternative theory they propose is firms initially achieving high market shares through legitimate competition, and subsequently using their positions as industry leaders to erect entry barriers.

Relatedly, Cowgill et al. (2023) show that mergers increase lobbying expenses, as the expenses post-merger are larger than the sum of the merging parties' expenses, and the effect is stronger as firms' sizes increase.

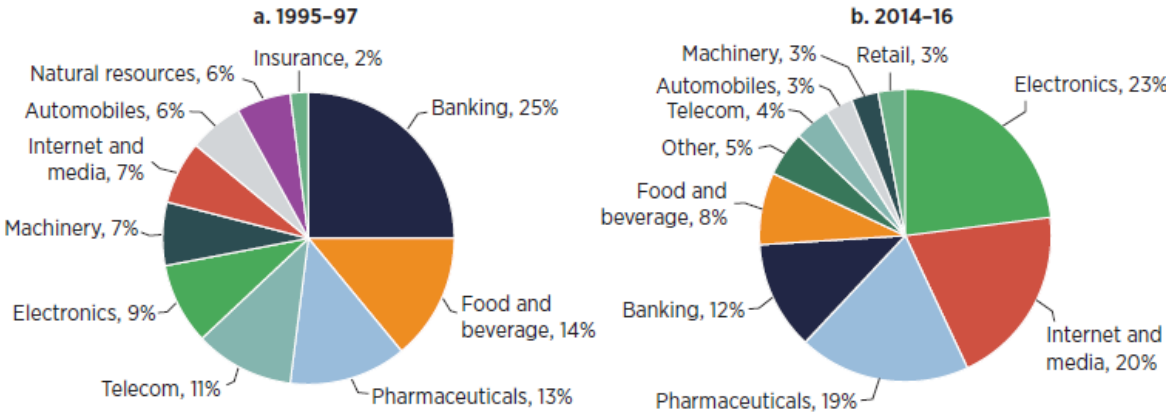
We will deepen this discussion in section 3.4 which further investigates the role of entry barriers (strategic or legal) in the continued ability of Superstar firms to outperform their competitors.

3.1.3 Sectoral and geographical distribution of Superstar firms

Although the rise of Superstar firms is a widespread phenomenon with broad macroeconomic effects, not all sectors of the economy are affected in the same way. While U.S. tech giants such as the GAFAMs may come to mind first, Superstar firms are not limited to the internet and tech giants. Nevertheless, some sectors are more exposed to the rise of Superstar firms than others.

Superstar firms can be active in all sectors of the economy and their sectoral diversity appears to have increased over the past 20 years. Manyika et al. (2018) for the McKinsey Global Institute use a database of nearly 6,000 of the world largest public and private firms whose annual revenues are greater than $1 billion. They study the change in sectoral distribution of the top 1% of firms ranked by economic profit (where economic profit is defined as a firm's invested capital times its return above the cost of capital).

Figure 3.1: Evolution of sectoral distribution of Superstar firms between 1995-1997 and 2014-2016



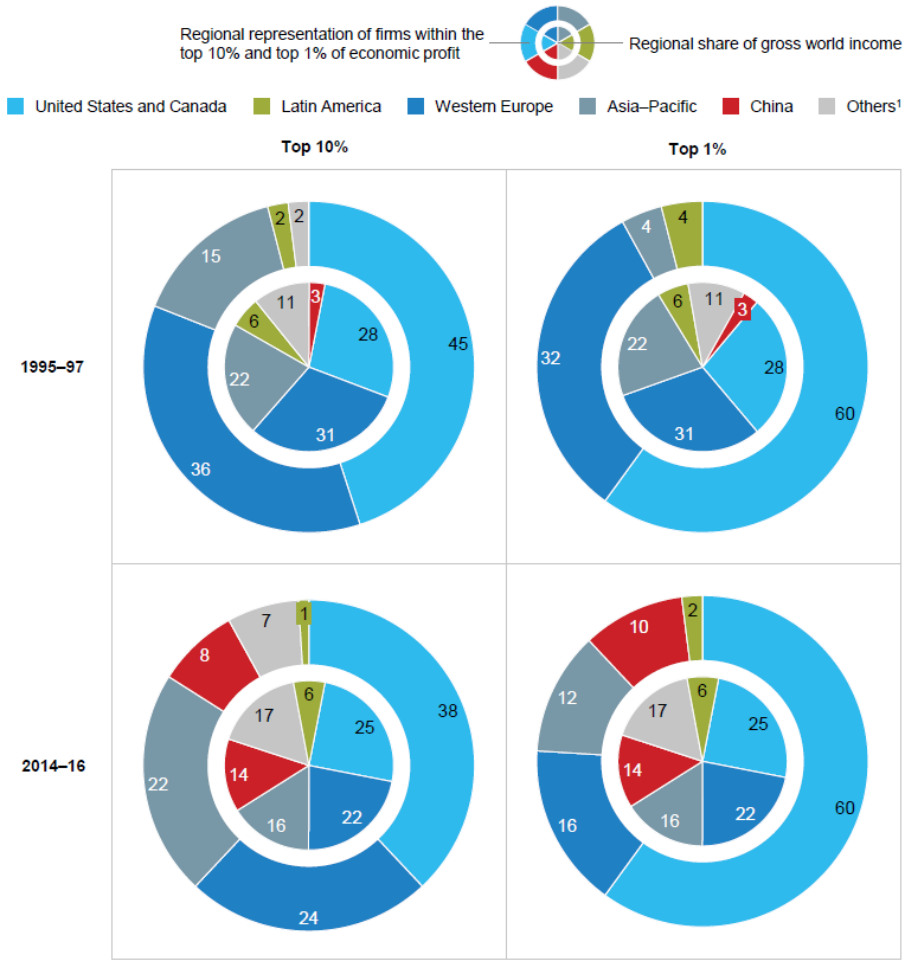
Source: "An Investment Perspective on Global Value Chains" by Qiang et al. 2021, World Bank Publications (relying on the database of Manyika et al. (2018)).

The pie charts depicted in Figure 3.1 rely on the database of Manyika et al. (2018). They illustrate the change in the sectoral distribution of Superstar firms (defined as the 1% firms with the largest economic profit among the sample of firms used by the World Bank) between the mid-nineties (1995-1997) and the mid-2010s (2014-2016). It shows that Superstar firms can be found across a wide variety of sectors, including electronics, internet and media, pharmaceuticals, banking, food and beverages, automobiles, telecom, machinery and retail. It also illustrates that the sectoral composition of Superstar firms has changed over time. In the mid-nineties, the banking sector and the food and beverages sector accounted for almost 40% of Superstar firms. 20 years later, the combined share of these two sectors has halved. More recently, Electronics (23%) and Internet and Media (20%) constituted the largest share of Superstar firms, while they only accounted for 9% and 7% of Superstar firms in the period 1995-1997 respectively. These new Superstar firms include giants such as Alibaba, Apple, Facebook and Oracle. The Pharmaceutical sector remained one of the most prevalent and its share increased from 13% to 19%.

A number of studies suggest that the Superstar firm phenomenon is most present in high tech sectors with highly skilled workforces (while also present in other sectors). For instance, Autor et al. (2020) confirm the wide sectoral distribution of Superstar firms. They study within-industry reallocation of economic activity in several industries and confirm their Superstar firm hypothesis in all economic sectors examined. They find

the strongest evidence for the Superstar firm hypothesis in high tech sectors, defined based on the share of technology-oriented jobs in the relevant industry. Andrews et al. (2016) find evidence of significant divergence in sales between Superstar and non-Superstar firms in both the manufacturing sector and the market services sector since 2000, particularly for information technology intensive services. Ayyagari et al. (2019) identify the Superstar firm pattern in terms of return to capital, particularly in industries with highly skilled workers and higher levels of intangible capital (but they believe that this observation is partly the result of mismeasurement).

Figure 3.2: Geographical distribution of the top-decile Superstar firms



Source: "Superstars: The Dynamics of Firms, Sectors and Cities Leading the Global Economy" by Manyika et al., 2018. McKinsey Global Institute.

The distribution of Superstar firms has evolved in geographical terms as well. Figure 3.2 represents the distribution by country or region of origin for the top-decile Superstar firms (see Manyika et al., 2018). It shows that most Superstar firms originate from the world's largest economies: more than 95% come from the G-20 countries. The United States still host the largest group of Superstar firms, but their share in the top-decile decreased from 45% in 1995-1997 to 38% in 2014-2016. Manyika et al. (2018) further report that Asian Superstar firms gained more relevance: firms from China, India, Japan and Korea increased from 7% in the 1990s to 27% of the top-decile. Firms headquartered in Western Europe make up 22% (down from 35%) of the top-decile. The overall picture of geographical distribution depicted in Figure 3.2 does not change

significantly if instead of looking at the distribution top-decile one focuses on the top-percentile (the top 1%), except that the share of becomes significantly bigger.

3.2 Definition of Global Superstars and methodology to identify them

The previous section reviewed the growing literature on Superstar firms, and their increasing prevalence. The remainder of this chapter studies the role of Global Superstars, where we focus on the most profitable of the largest global firms and analyse whether a superstar effect can be found within the restricted group of firms that are globally active.

Studying Global Superstars requires to define them. While there is a general agreement on the broad nature of Superstar firms and their role in driving up margins and concentration at the industry level, the exact definition of such firms is much less clear. Which criteria should be used to distinguish Global Superstars? Distinctively larger turnover (and market shares), or profits, or profitability? Or a combination of these criteria? Or a minimum level of turnover, profits and profitability? Should these criteria be applied sector by sector, keeping only the largest firms for each sector, or should they be applied across sectors?

For this study the identification of Global Superstars builds on methods previously proposed in the academic and business literature. We have considered a combination of the following dimensions of performance: minimum and absolute revenue, absolute value of profits, profit rate (i.e., total profit divided by turnover) and market capitalization (market capitalization was dropped in the end to cover also non-listed firms). For a number of reasons set out below, the study relies on the Fortune Global 500 dataset.

After describing the Fortune Global 500 dataset, we explore the different dimensions considered and provide descriptive statistics, with a view to explore whether the choice of criteria leads to identify different Global Superstars. In essence, if different dimensions are perfectly correlated, the choice of variable will not matter (much), because whatever variable is chosen to select Superstar firms will lead to (almost) the same firms being identified as Global Superstars. If, instead, there is little overlap between the various dimensions, the choice of variables, and the manner in which variables are eventually aggregated, will play an important role in the selection of Superstar firms.

3.2.1 Dataset

Several sources of data were considered, namely, ORBIS, Compustat Fundamentals and Fortune Global 500. The most important criteria to choose our primary source of data were the number of firms covered and the categories of firms covered (global, public and private firms), the period of time spanned by the data, the variables included in the dataset, the quality and the consistency of data across periods and regions. Based on these criteria, Fortune Global 500 was selected as primary data source. The data was acquired from Fortune Media (USA) Corporation in March 2023.[272]

Fortune's Global 500 data is an annual list of the largest 500 global (private and public) companies—based on revenue. The dataset contains information includes data on non-listed firms and state-owned enterprises and covers the period going from 1998 to 2022.

[272] *A main advantage of Fortune Global 500 is that the data (for firms covered) is consistent, comprehensive and, notably, it goes back to 1995. Other databases contain more missing information, in particular, in earlier years.*

It includes several metrics that can be used to identify and characterise Global Superstars: revenue, profit, market value and profit rate (profit over turnover).

Importantly the data reported for any given year (take 2022 as an example, but the same reasoning applies to other years) in the dataset refers to the companies' fiscal years that ended on or before 31 March 2022.[273] Hence, the data points for 2022 do not reflect business activity in the whole calendar year 2022, but either the activity in the calendar year 2021 or in the latest fiscal year before the mentioned cut-off date. Since companies have different fiscal years, and not all fiscal years coincide with calendar years, some discrepancies are unavoidable. Therefore, whenever we report a statistic from Fortune Global 500 for a specific year, this refers to this year's data in the Fortune Global 500 data set.

The most recent data available in the Fortune Global 500 dataset at the time of the study was 2022 and so the analysis covers data from 1998 to 2022. The latest released dataset of year 2023 had become available before the study was published, which allowed comparison of the information contained in the datasets of 2022 and 2023. The results of this comparison can be found in Annex C.2.2.

The dataset also reports information on the industry in which firms operate. Fortune Global 500 classifies each company in one single industry, even when its activities span across multiple industries. The industry classification takes a consumer perspective and gives priority to the main area of activity of each firm over secondary ones. For instance, Meta Platforms, Apple, Amazon and Alphabet are all classified in the industry "Internet Services and Retailing", while Berkshire Hathaway is classified as operating in the "Insurance: Property and Casualty Stock" industry). Therefore, the industry classification of Fortune Global 500 does not necessarily align with standard classification systems such as NACE or NAICS.

Next to the fact that it contains the main variables of interest (revenue, profit, profit rate and market value) and that it covers a relatively long period of time (1998-2022), the main comparative advantage of the Fortune Global 500 database is that it includes private, public and state-owned firms. The pre-selection made by Fortune Global 500 comes with two disadvantages: first, the sample size is smaller than for other data sources and, second, the sample is less stable, because firms enter and leave the database every year. But Fortune Global 500 ensures that data can be compared across jurisdictions. And, given our focus on the world's largest firms, the size of the sample is less crucial for our work, as (with some exceptions) we do not draw comparisons with significantly smaller firms. Annex C.2 contains summary statistics on the Fortune Global 500 dataset.

All values reported in the Fortune Global 500 dataset are used as they are reported in the dataset for the purpose of the study. In this context it should be noted that some entries in the dataset might be considered outliers. For instance, Fortune Global 500 reports a profit rate of 185% for British American Tobacco in 2018 and a profit rate of -122% for United Airlines (UAL) in 2006. Such extreme profits rates are hardly resulting from ordinary business operations but likely from one-time effects. Yet, from a long-run perspective, such one-time effects are part of business, which is why they are included in the analysis. Their effect is mitigated in any case, since five-year averages of company performance are used to identify Global Superstars (see section 3.2.3). Nevertheless, Annex C.3.4 provides an alternative analysis that excludes outliers.

[273] *https://fortune.com/franchise-list-page/global-500-methodology-2022/.*

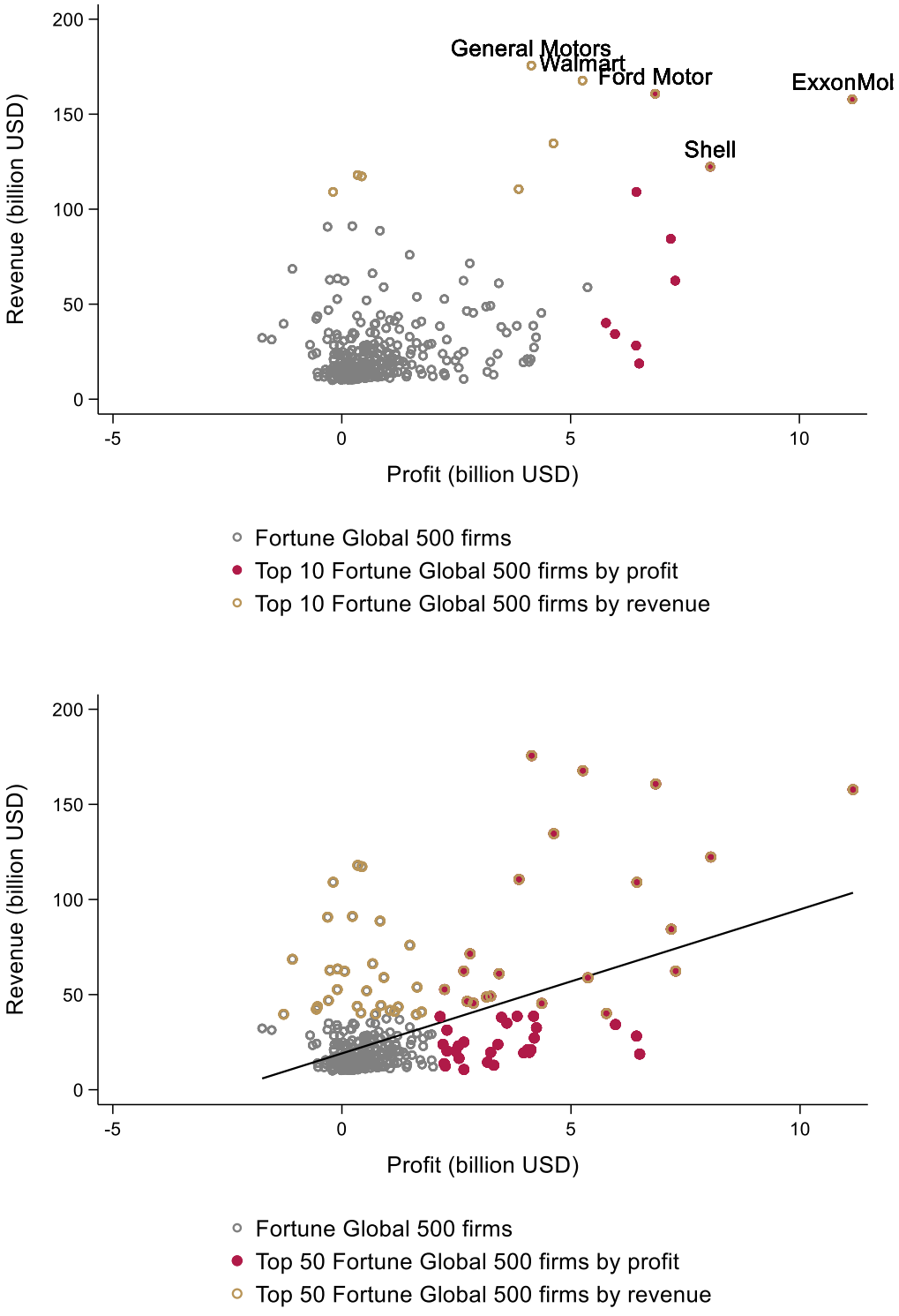
3.2.2 Defining Global Superstars: how much does the metric matter?

Global Superstars are globally relevant firms that are distinctively larger than other in terms of revenues and profits. To study whether and to what extent these firms have become more prevalent over the last decades (and to look at their role in driving up margins and concentration), one first needs to define them. Looking at firms, whatever the metric, it is not clear where to draw the line between large or productive firms and very large or very productive firms, or between stars and superstars. It is not even clear what the appropriate metric ought to be.

Figure 3.3 and Figure 3.4 explores the relation between profits and revenue for the earliest and latest period, respectively. The horizontal axis of the graph gives a firm's average absolute profit within the relevant period, the vertical axis gives a firm's average revenue within the same period.[274] On the upper side of the graphs, a grey ring represents a firm that is not placed within the top 10 firms by either of the variables represented on the graph, a red dot represents a firm that is in the top 10 by absolute profit, a golden ring represents a firm placed in the top 10 by revenue. A red dot with an overlapping golden ring represents a firm that is ranked in the top 10 by both graphed variables. The same colour scheme applies to the top 50, at the bottom of the graphs.

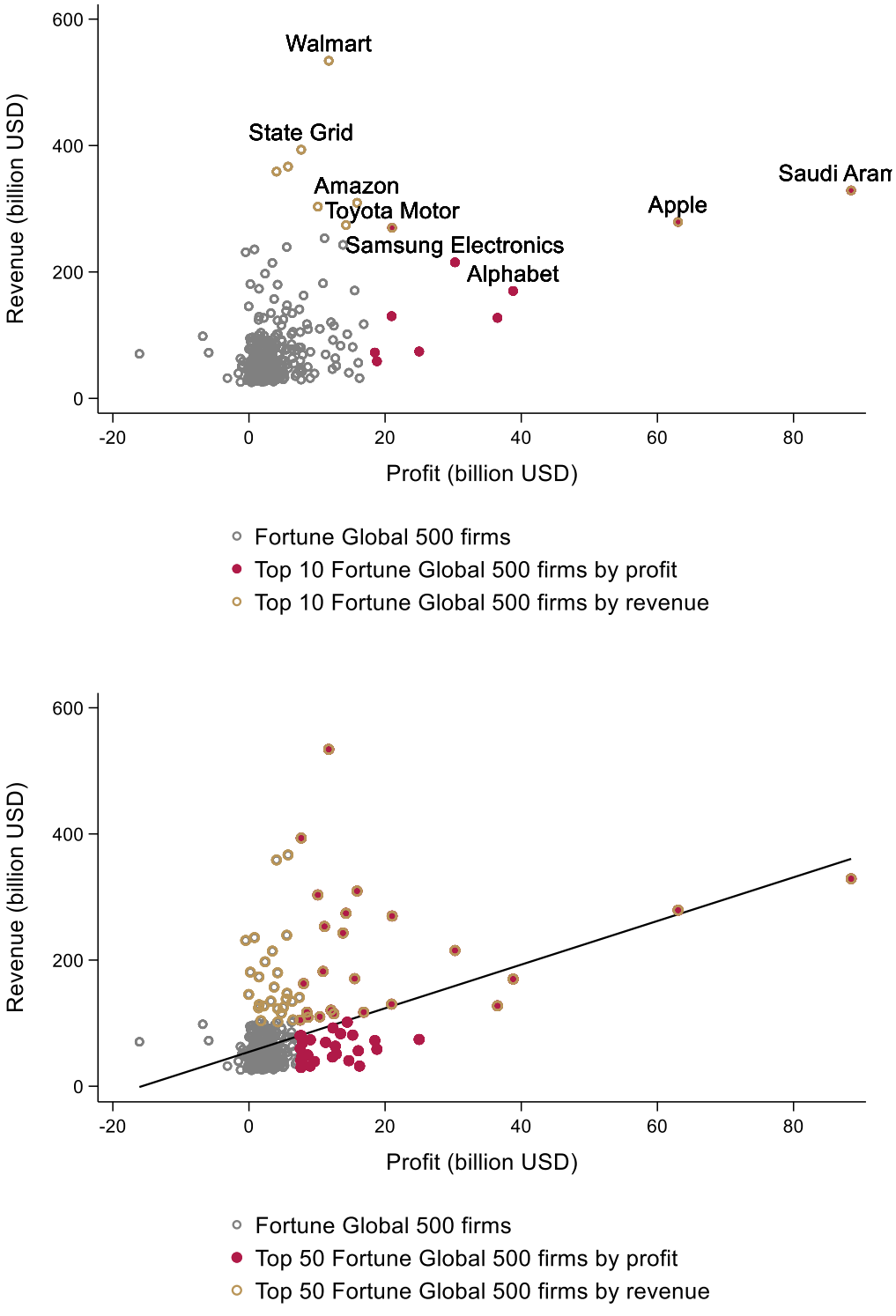
[274] *A description of how data is consolidated and made consistent over five-year periods can be found in Annex C.1.*

Figure 3.3: Profit and revenue in five-year period 1998-2002



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission. Note: An outlier with negative profit larger than 5 billion USD is excluded for readability purpose.

Figure 3.4: Profit and revenue in five-year period 2018-2022



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.3 and Figure 3.4 provide evidence on the distribution of profit and revenue of firms in the Fortune Global 500 dataset. First, while the dataset only covers the largest

firms globally, it appears that some of these firms have distinctively larger revenues and profits than others. Second, the firms with the largest turnover are not always the firms with largest profits. An interesting example is Walmart (see upper side of Figure 3.4; the same reasoning holds for Amazon). Walmart has the highest revenue of all Fortune Global 500 firms, but its profit and profitability are not very high (in comparison to other Fortune Global 500 firms; in essence because the retails sector is a sector with large turnover, and low profitability).[275]

3.2.3 The identification of Global Superstars based on a composite index

Global Superstars can be selected based on several metrics, such as absolute level of profit, profit rate, total revenue and market capitalisation. The absolute level of profits is indicative of a firm's size and market power, albeit imperfectly. Profit rate reflects a firm's efficiency or its ability to price above cost, for instance because of market power. Market capitalisation, in turn, reflects investors' expectations of a firm's future profitability, and thus also whether a Global Superstar is expected to remain a Global Superstar.

Basing the selection of Global Superstars on market capitalization brings two problems. First, market capitalization is only available for listed firms (and not for privately held firms and state-owned enterprises). Second, it evolves (sometimes significantly) with several factors, such as interest rates and the evolution of stock exchanges. Consequently, it was decided not to use market capitalization as a selection criterion for Global Superstars.

After considering various options, and discussing methodological issues thoroughly with the DG COMP and other experts, our selection of Global Superstars was based on the following methodology:

- To ensure that Global Superstar only comprise firms with (very) significant sales, we used Fortune Global 500 as a source of data. This guarantees that the database of Global Superstars only includes firms which are amongst the world's 500 largest firms by revenue in a given year. No additional pre-filtering of smaller firms is therefore necessary.
- For each five-year period, a composite indicator is constructed using profit rate and absolute profit:
    - For each firm, the five-year average of profit and profit rate is calculated, over the same 5-year periods, between 1998 and 2022.
    - Index values for profit and profit rate are obtained by dividing firms' five-year averages by the highest five-year average (highest within the given period). Hence, the firm with the highest average revenue is assigned an index value of 1, while the index values for all other firms are below 1.
    - A firm's composite index value is the unweighted mean of its profit index and profit rate index.

In the final step, for each five-year period from 1998 to 2022, the top 50 firms according to the composite index are identified. These firms are referred to as "Global Superstars" in this report. More details on the methodology can be found in Annex C.1.

[275] *As a consequence, Walmart is not always in the list of Global Superstars despite its high ranking in terms of revenue, see Table 3.1 below.*

To complement the analysis, Annex C.3.1 and Annex C.3.2 lists the 30 largest firms by only absolute profit and by only profit rate, respectively. Note that a Global Superstar is not necessarily among the top 30 in terms of profit or profit rate.

As a robustness analysis, Annex C.3.4 shows the list of Global Superstars when using and alternative composite index that includes revenue as a third component and when removing extreme outliers from the dataset.

3.3 The Global Superstars

This section presents the lists of Global Superstars for each five-year period from 1998 to 2022 and explains how the composition of the Global Superstars has evolved over time. The historic evolution of Global Superstars is further depicted through an analysis of how profit and profit rate of Global Superstars has developed compared to other large firms. We also illustrate the evolution of the distribution of performance within the group of Global Superstars and of other features of Global Superstars, like there geographic origin.

This section excludes the financial sector from the analysis of Global Superstars, mainly because traditional measures of profit and profitability are difficult to compare between the financial sector and other sectors of the economy. Moreover, turnover and profit in the financial sector are more directly affected by macroeconomic factors. A list of Global Superstars including financial firms can be found in Annex C.3.4. The inclusion of financial firms in the main body would not change the results qualitatively.

3.3.1 Ranking of Global Superstars

As discussed in section 3.2.3, the identification of Global Superstars is based on a composite index applied to the world's largest companies. This composite index is the unweighted average of a profit index and a profit rate index. Table 3.1 lists the 50 highest-ranked firms in terms of the composite index. These firms are the Global Superstars according to the methodology outlined above.

Table 3.1: The Global Superstars – 50 highest-ranked firms by composite index

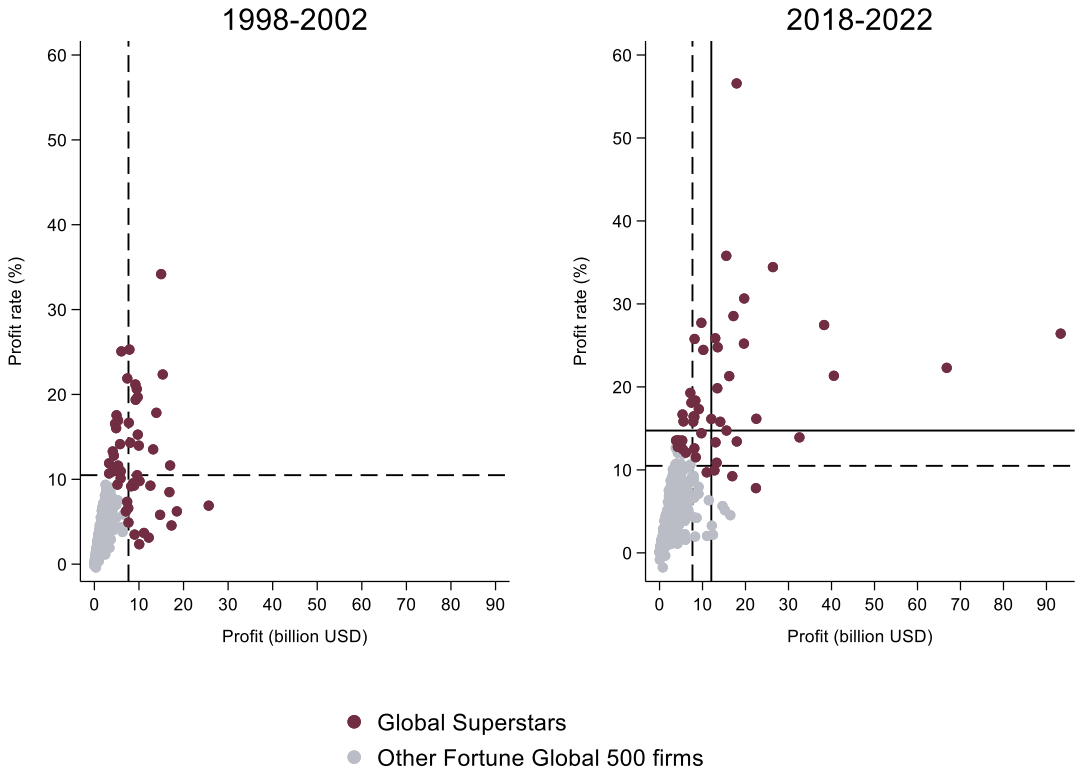
	1998-2002	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
1	Microsoft	Microsoft	Gazprom	Apple	Saudi Aramco
2	Intel	ExxonMobil	Vale	Vodafone	British American Tobacco
3	ExxonMobil	Gazprom	Microsoft	Oracle	Apple
4	Merck	Petronas	ExxonMobil	Microsoft	Microsoft
5	Cable and Wireless	Pfizer	BHP	Philip Morris	Meta
6	Philip Morris	GlaxoSmithKline	Petronas	Alphabet	Alphabet
7	GlaxoSmithKline	Johnson and Johnson	Rosneft Oil	Hutchison Whampoa	TSMC
8	Eli Lilly	Merck	Philip Morris	Qualcomm	Tencent
9	Bristol-Myers Squibb	Philip Morris	Alphabet	Pfizer	Pfizer
10	Novartis	Novartis	Petrobras	Johnson and Johnson	Intel
11	Pfizer	Shell	Occidental Petroleum	Gazprom	Rio Tinto
12	Petronas	Petrobras	Nestle	Intel	SK hynix
13	SBC Communications	Coca-Cola	AstraZeneca	Novartis	Samsung Electronics
14	Shell	Intel	Johnson and Johnson	Roche	Novartis

15	IBM	BHP	Coca-Cola	Cisco Systems	Alibaba
16	Johnson and Johnson	National Grid	Novartis	Samsung Electronics	Philip Morris
17	Dupont	China National Petroleum	Oracle	ExxonMobil	Oracle
18	Coca-Cola	Cisco Systems	Shell	IBM	Verizon
19	AT&T	AstraZeneca	Surgutneftegas	AB InBev	Roche
20	Ford Motor	China Mobile Communications	Apple	GlaxoSmithKline	Johnson and Johnson
21	BP	BP	Chevron	McDonald's	Gazprom
22	BellSouth	Wyeth	Merck	Coca-Cola	Comcast
23	LUKOIL	Eli Lilly	Intel	Twenty-First Century Fox	Coca-Cola
24	Abbott	LUKOIL	Roche	Walt Disney	Sanofi
25	Eni	Telstra	Procter and Gamble	Procter and Gamble	Procter and Gamble
26	Verizon	Eni	Vodafone	3M	Cisco Systems
27	Anglo American	Total	IBM	Nestle	Abbvie
28	Telstra	Procter and Gamble	China Mobile Communications	Merck	Merck
29	Roche	BellSouth	Cisco Systems	Petronas	Vale
30	PDVSA	PepsiCo	Anglo American	Toyota Motor	Toyota Motor
31	Philips	Samsung Electronics	GlaxoSmithKline	Telstra	Nestle
32	Procter and Gamble	Toyota Motor	TNK-BP	L'Oreal	BHP
33	Walmart	Chevron	British American Tobacco	Sabic	Softbank
34	AstraZeneca	3M	Telefonica	China Mobile Communications	SAP
35	Enel	L'Oreal	Pfizer	Sanofi	3M
36	Petrobras	Abbott	Oil and Natural Gas	Rosneft Oil	AT&T
37	McDonald's	IBM	Sanofi	Comcast	China Mobile Communications
38	Nokia	Anheuser-Busch	Rio Tinto	AT&T	Home Depot
39	Tyco International	Eon	Total	Chevron	Unilever
40	Daimler	Anglo American	America Movil	Verizon	Honeywell
41	Chevron	Nokia	McDonald's	Time Warner	PepsiCo
42	Nestle	Posco	AT&T	AstraZeneca	L'Oreal
43	Anheuser-Busch	British American Tobacco	Schlumberger	Mondelez	Huawei
44	Minnesota Mining and Mfg	Bristol-Myers Squibb	BP	Delta Air Lines	Medtronic
45	PepsiCo	BT	Sabic	PepsiCo	Mondelez
46	Total	ConocoPhillips	Akzo Nobel	United Technologies	ConocoPhillips
47	Toyota Motor	Nestle	China National Offshore Oil	Unilever	KDDI
48	Kimberly-Clark	Walmart	LUKOIL	Softbank	CK Hutchison
49	General Motors	Roche	China National Petroleum	BT	Anglo American
50	Unilever	Endesa	Abbott	Honeywell	Inditex

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.5 depicts the profit rate and absolute profit (adjusted for inflation) required to qualify as Global Superstars, respectively in the first and the last period studied. The dashed lines indicate the thresholds required to qualify in the first period for the top-30 in terms of profit and profit rate, respectively. The solid line (only in the right figure) indicates the corresponding thresholds in the last period. The threshold in terms of profit rate increased from approximately 10% in 1998-2002 to 15% in 2018-2022, while the threshold level for absolute profit (adjusted for inflation) increased from approximately 8 billion USD in 1998-2002 to 12 billion USD in 2018-2022.

Figure 3.5: Profit and profit rate of Global Superstars: 1998-2002 and 2018-2022



Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Firms with negative average profit are excluded from the figure to improve readability. Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.5 shows that Global Superstars have become more profitable over time, both in absolute terms and in relative terms (profit rate). Indeed, one can not only see that the absolute profit and the profit rate required to belong to the top-30 firms have increased significantly, but also that the profit and profit rate of the firms enjoying the largest profit and profit rate have increased sharply.

Global Superstars cover most of the best performing firms for both underlying metrics (absolute profit and profit rate). Yet, it is also noteworthy that several firms that make it to the top-50 list (Global Superstars) would not make it into the top-30 list in terms of absolute profit or in terms of profit rate alone, as Global Superstars are selected based on a composite indicator, which is constructed using both profit and profit rate (as explained in section 3.2.3).

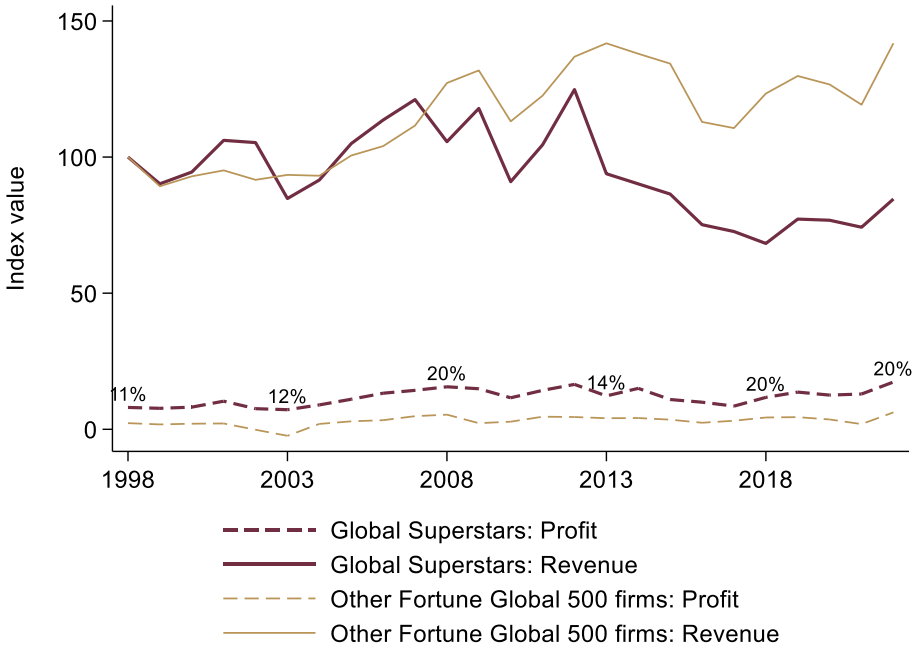
Figure 3.5 also illustrates a trend at the top-end of the world's largest firms: even after adjusting for inflation, today's Global Superstars enjoy higher profits and (to a lesser

extent) higher profit rates than Global Superstars did 20 years ago. This development will be further discussed in section 3.3.2.

3.3.2 Revenue and profit of Global Superstars

Figure 3.6 shows the development of the average profit and revenue of Global Superstars, compared with the average profit and revenue of other Fortune Global 500 firms (adjusted for inflation). To make comparisons easier, the average revenue is normalised to 100 in 1998. Profit is scaled to reflect the size of average profit relative to average revenue in a given year. The average profit rate is labelled for selected years.

Figure 3.6: Evolution of profit and revenue of Global Superstars and other Fortune 500 companies

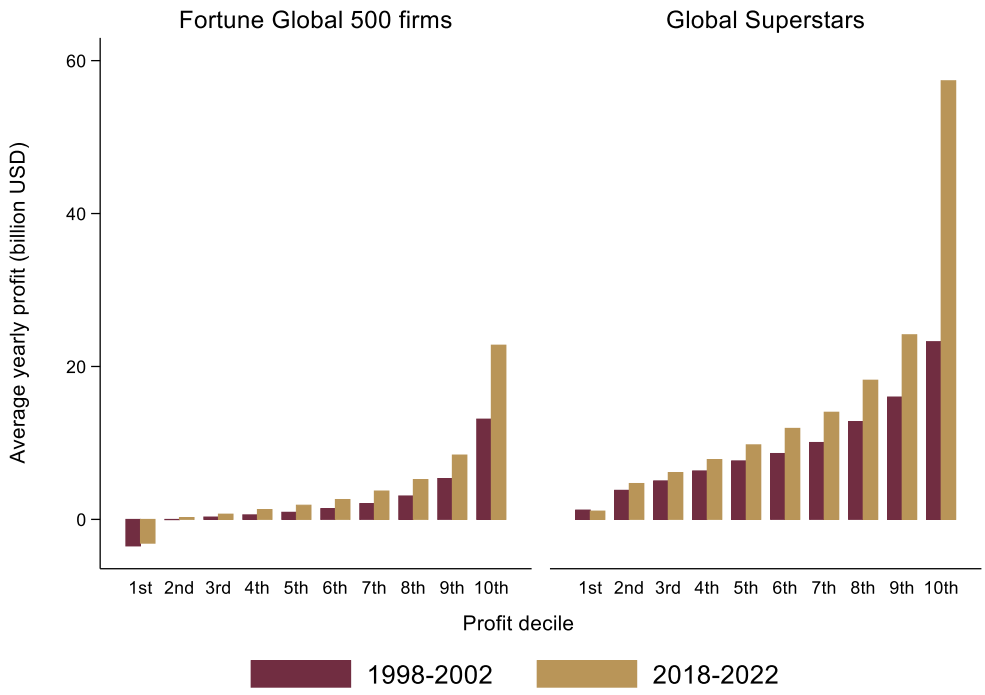


Note: Revenue is shown as an index (1998 = 100); profit is shown relative to the index value of revenue in the corresponding year. Percentages show the profit rate of the Superstar firms. All values are in 2022 US dollars – adjusted using IMF world consumer price index. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.6 shows that, after adjusting for inflation, the evolution of average revenue of Global Superstars and the average revenue of other Fortune Global 500 companies over the last 25 years does not follow a clear trend. Over the same period, the profit rate of Global Superstars has almost doubled, growing from 11% in 1998 to 20% in 2022, while there was only a small increase in profit rate for the average Fortune Global 500 firm. Profits of firms at the top of the distribution have increased significantly more than in the average global firm, resulting in a widening gap between profits of Global Superstars and other Fortune Global 500 firms.

In addition to the development of average revenue and profitability, it is also worth highlighting that the distribution of firm performance changed over time. Figure 3.7 compares the distribution of profit for Global Superstars and other Fortune 500 firms (adjusted for inflation). The figure compares the profit by decile across the two five-year periods 1998-2002 and 2018-2022.

Figure 3.7: Distribution of profit by decile — Global Superstars vs. Fortune Global 500 firms

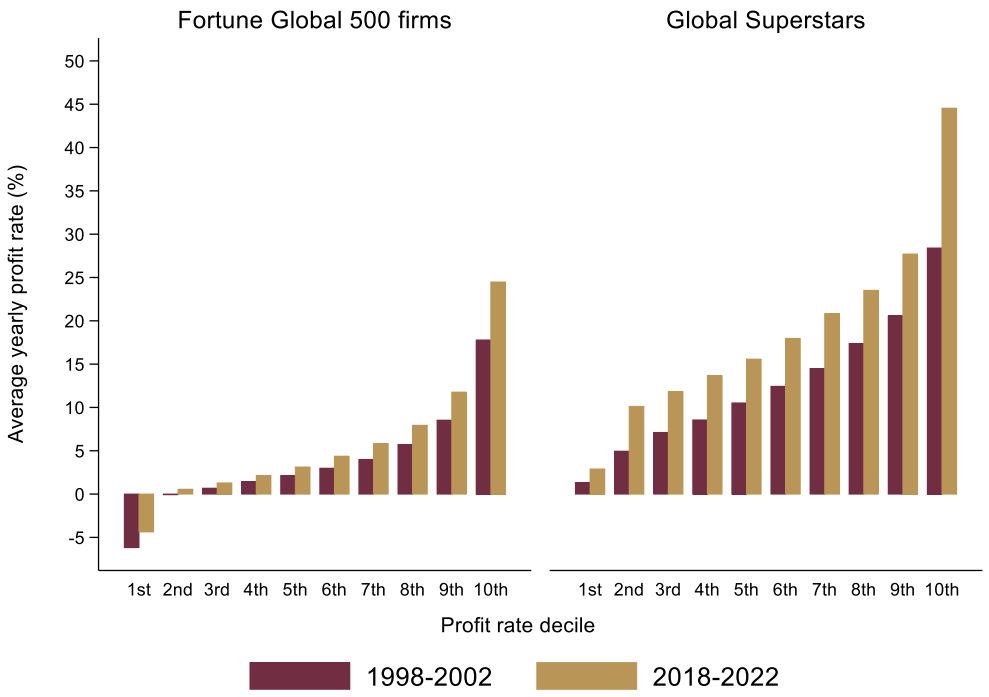


Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.7 confirms that profit increases at the top of the distribution. Profit of the firms with the highest profits has increased over time and the most profitable firms (10th decile) became even more profitable both in absolute terms and relative to less profitable firms. Meanwhile, profits of Global Superstars have grown substantially since 1998. The growth is particularly pronounced for the top decile, i.e. the top 5 firms.

Figure 3.8 compares the distributions of profit rate by decile between Global Superstars and other firms in Fortune Global 500 across the two five-year periods 1998-2002 and 2018-2022.

Figure 3.8: Distribution of profit rate by decile — Global Superstars vs. Fortune Global 500 firms

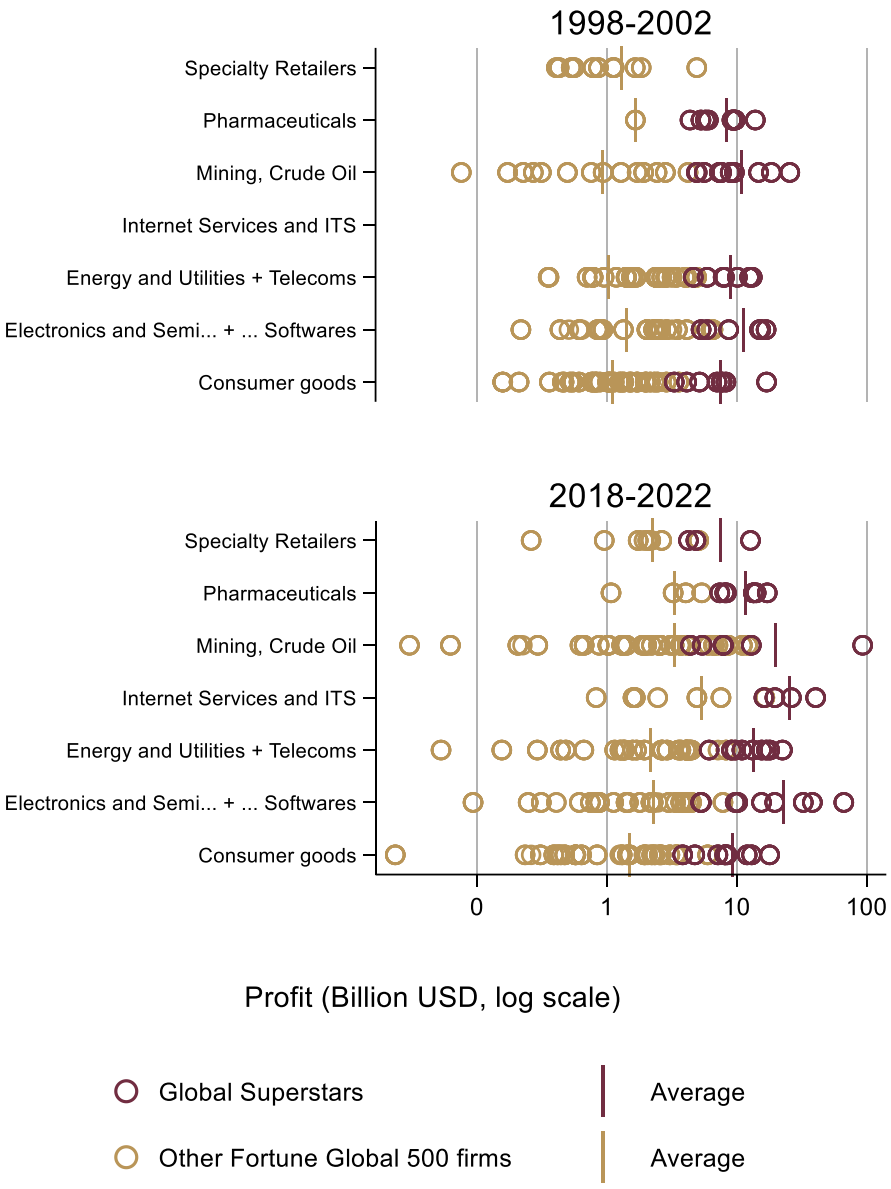


Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

The increasing divergence in the performance of Global Superstar and the performance of non-Global Superstar firms appears even more significant when measured using profit rate instead of absolute profit. The difference in average profit rate between the top 10% of Global Superstars and the top 10% of the firms in Fortune Global 500 grows from approximately 10 percentage points in 1998-2002 to approximately 20 percentage points in 2018-2022.

Figure 3.9 represents the distribution of profit for Global Superstars (red dots) and other Fortune 500 firms (golden dots) for a selection of sectors in which the top 10 Global Superstars operate in the period 1998-2022. The vertical lines represent the average profit by sector in a specific period (applying the same colour code).

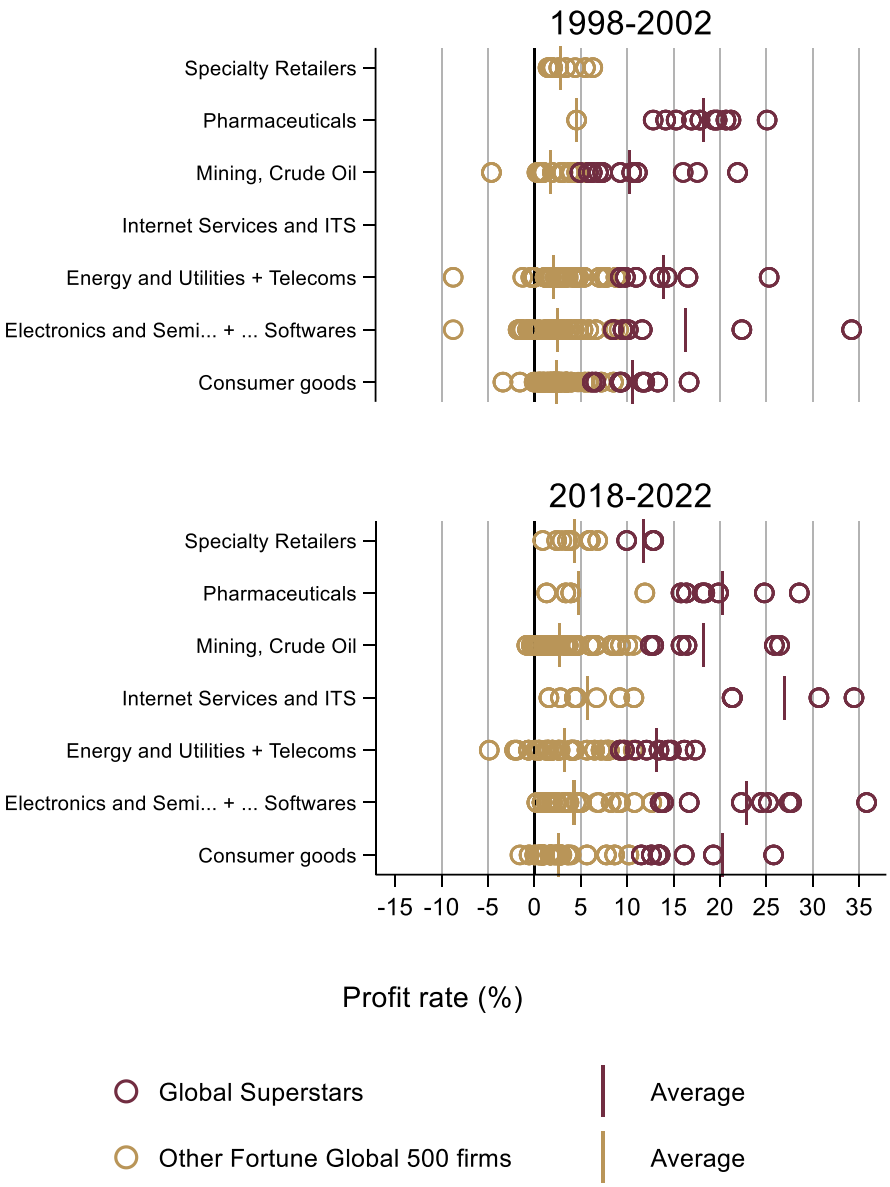
Figure 3.9: Profit by sector: Global Superstars vs other Fortune 500 firms.



Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Negative profits are not included in the graph. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Global Superstars have larger profits than other Fortune 500 companies: the red dots are positioned at the right of each x-axis for both 1998-2002 and 2018-2022 periods. The red vertical lines, which reflect average profit for Global Superstars in each sector moved further to the right overtime. Similar trends are observed in Figure 3.10, which plots profit rate instead of profit.

Figure 3.10: Profit rate by sector: Global Superstars vs other Fortune 500 firms.



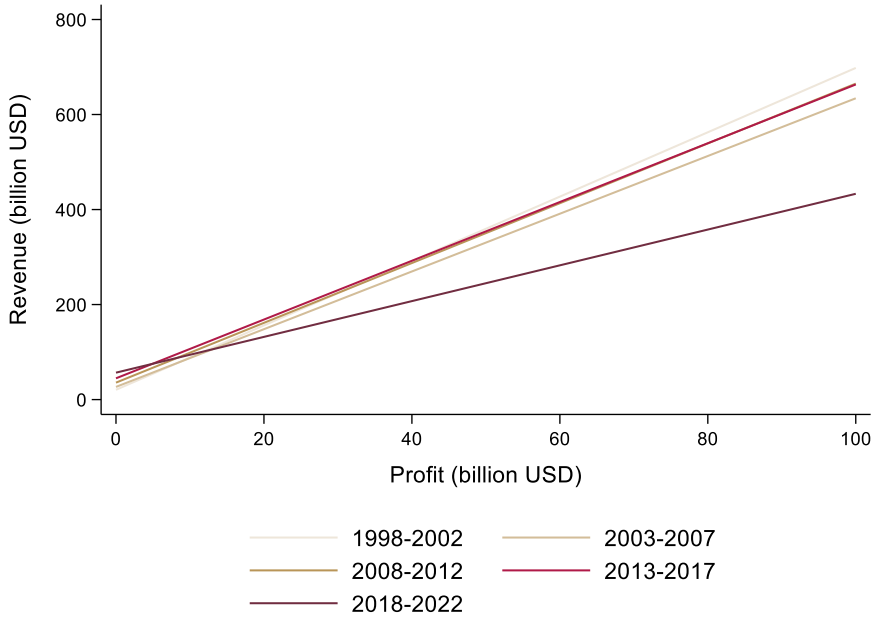
Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.9 und Figure 3.10 confirm that Global Superstars are distinctively more profitable than other firms, and that the profitability gap with other large firms has increased overtime.

Figure 3.11 shows the linear prediction (based on a simple regression) between profit and revenue for each five-year periods. When comparing the first and the latest period, the profitability of the largest firms has increased over time, because for an identical

level of revenue, the associated profit has become larger (represented by lines progressively becoming flatter). Or, put differently, the graph shows that that, on average, profits have become higher compared to revenues over time. For example, by looking at Figure 3.11, we see that for a firm with 100 billion USD profit, the regression predicts a level of revenue equal to approximately 700 billion USD in the period 1998-2002, a level of 600 billion USD in 2008-2012, and finally a level of approximately 400 billion USD in 2018-2022.

Figure 3.11: Regression of revenue on profit for all five-year period

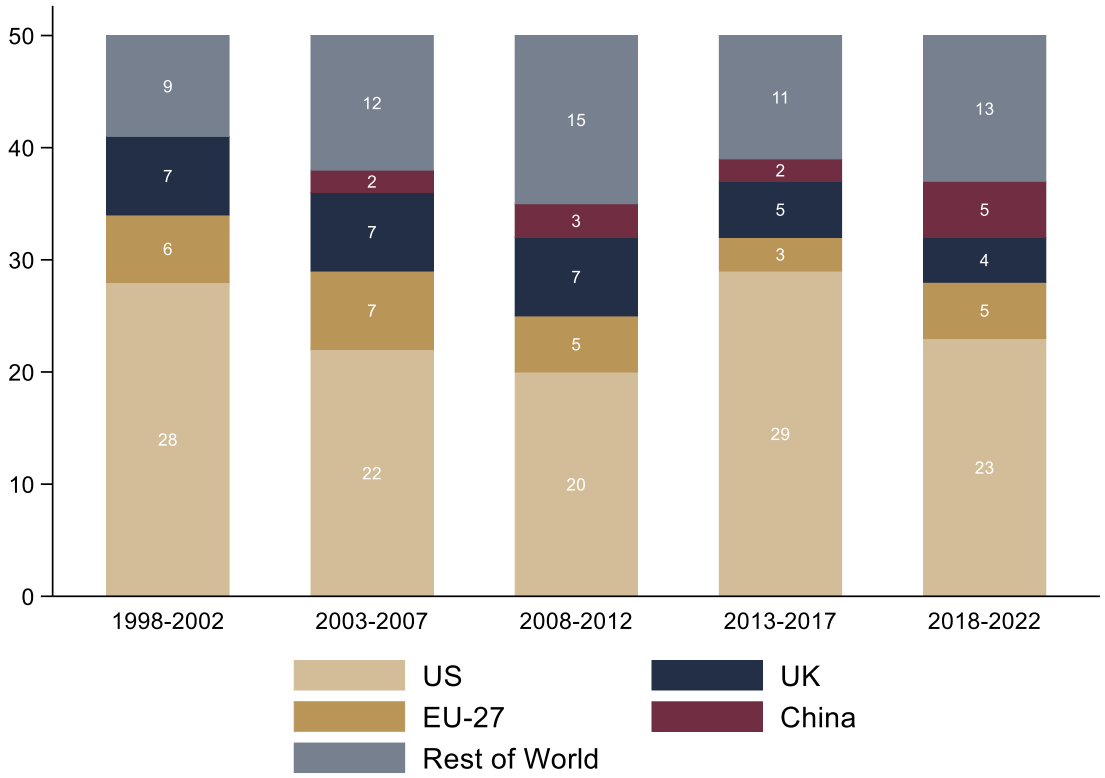


Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

3.3.3 Geographical origin of Global Superstars

Most Global Superstars are active across the globe and their geographical footprint in terms of sales can be much wider than their country of origin. Yet, the geographical incorporation of Global Superstars reflects to some extent a region's capacity to nurture very large companies that are successful on a global stage. Figure 3.12 shows the number of Global Superstars by region for each five-year period.

Figure 3.12: Geographical origin of Global Superstars



Note: For three Global Superstars the country information recorded in Fortune Global 500 changes within certain five-year periods and is therefore consolidated within each five-year period. The consolidation is done by keeping as country of origin the country with the highest number of entries in the five-year period for that specific firm. Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.12 shows that most Global Superstars are incorporated in the U.S. The U.S. hosts around half of the Global Superstars, and while the weight of the US has declined between 1998 and 2012, its presence rose again since then. China hosts an increasing number of Global Superstars, as the largest Chinese companies made it to the top of the list. Finally, the share of EU and UK incorporated Global Superstars has slightly declined over the last 25 years.

3.3.4 Sectors of activity of Global Superstars

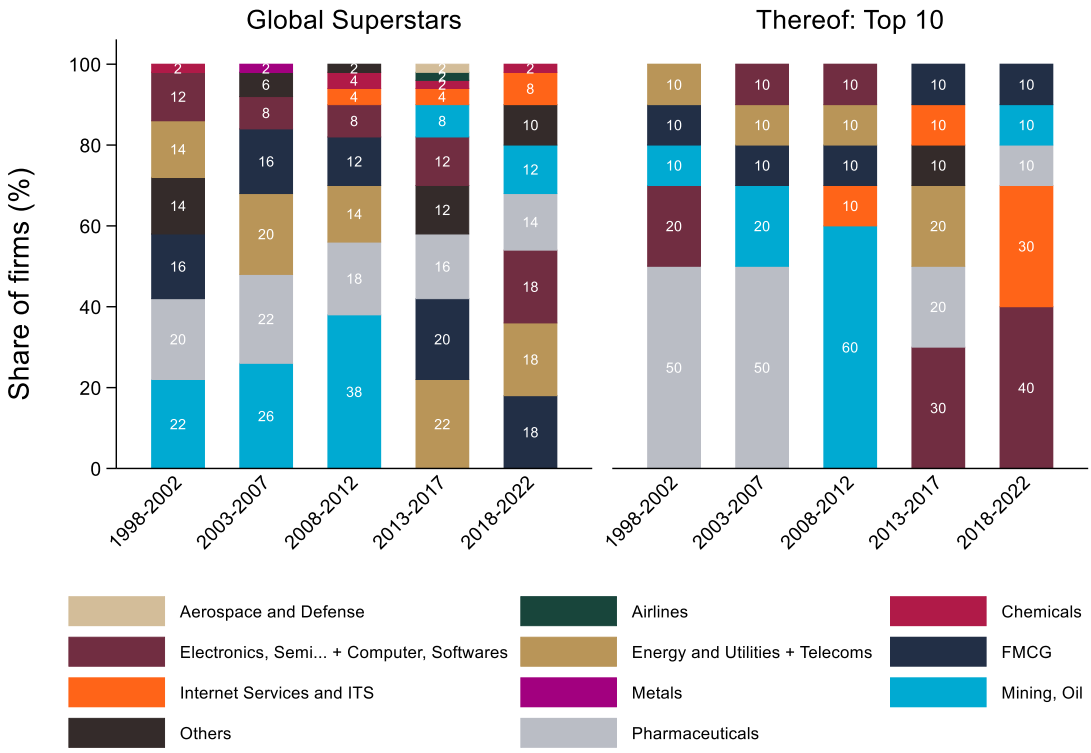
This section studies in which sectors Global Superstars are active and whether these sectors differ from other sectors of the economy. The main takeaway from this section is that Global Superstars are not confined to specific sectors. We also study the characteristics of these sectors, and how Global Superstars differ from other firms in their sector. Our analysis is less conclusive here: while distinctively more profitable than other large firms in their sector (see also section 3.3.2), Global Superstars do not clearly distinguish themselves from other large firms in terms of other characteristics studied.

Figure 3.13 shows in which sectors the Global Superstars are active. The sector allocation is built starting from the industry classification provided by Fortune Global 500 (some sectors are aggregated to enhance the readability of the graphs, see note below the graph). This classification takes a consumer perspective, trying to identify in

which sector a given company generates the bulk of its turnover. This consumer perspective cannot always be reconciled with the more supply-driven approach of the NACE classification, whereby firms are classified based on their historical sector of activity.

The figure shows the distribution for all 50 Global Superstars as well as the 10 highest ranked Global Superstars of each period.

Figure 3.13: Sector allocation Global Superstars (in %)

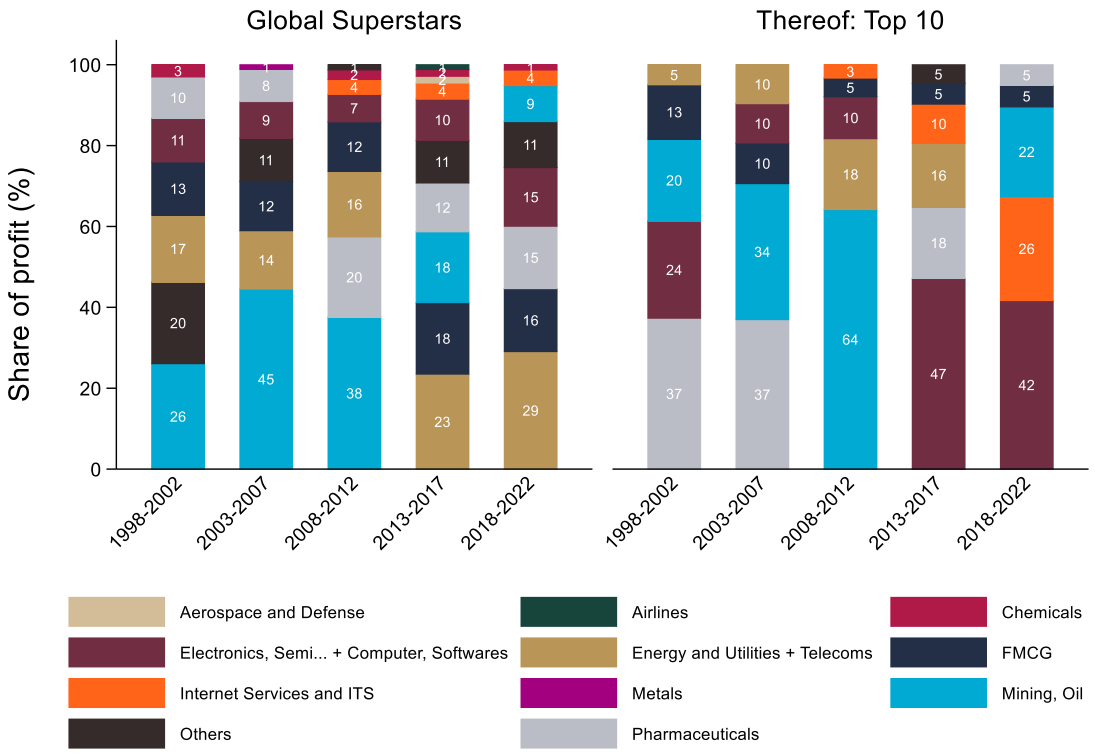


Note: Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Sector "FMCG" is the abbreviation for "Food and Beverages + Tobacco + Household, Personal and Cosmetic Products". Sector "Others" include the following sectors: "Motor Vehicles and Parts", "General Merchandisers", "Specialty retailers", "Entertainment", "Scientific, Photo, Control Equip.", "Forest and Paper Products", "Health Care". Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.13 shows not only that Global Superstars are active across a wide range of sectors, but also that the distribution has evolved considerably over time. For what concerns specific sectors, the presence of Pharmaceuticals, internet services and electronics (at large) appear to have increased at the top of the distribution. In contrast, mining, oil and energy production has become less prevalent amongst Global Superstars: while these companies were still large in terms of revenues, their profits have dropped in the last decade in comparison to other sectors.

Figure 3.14 shows the distribution of sectors where Global Superstars are active, where the allocation is based on share of profit (as opposed to the number of firms). This metric does not change the picture significantly.

Figure 3.14: Profit share of Global Superstars by sector (in %)



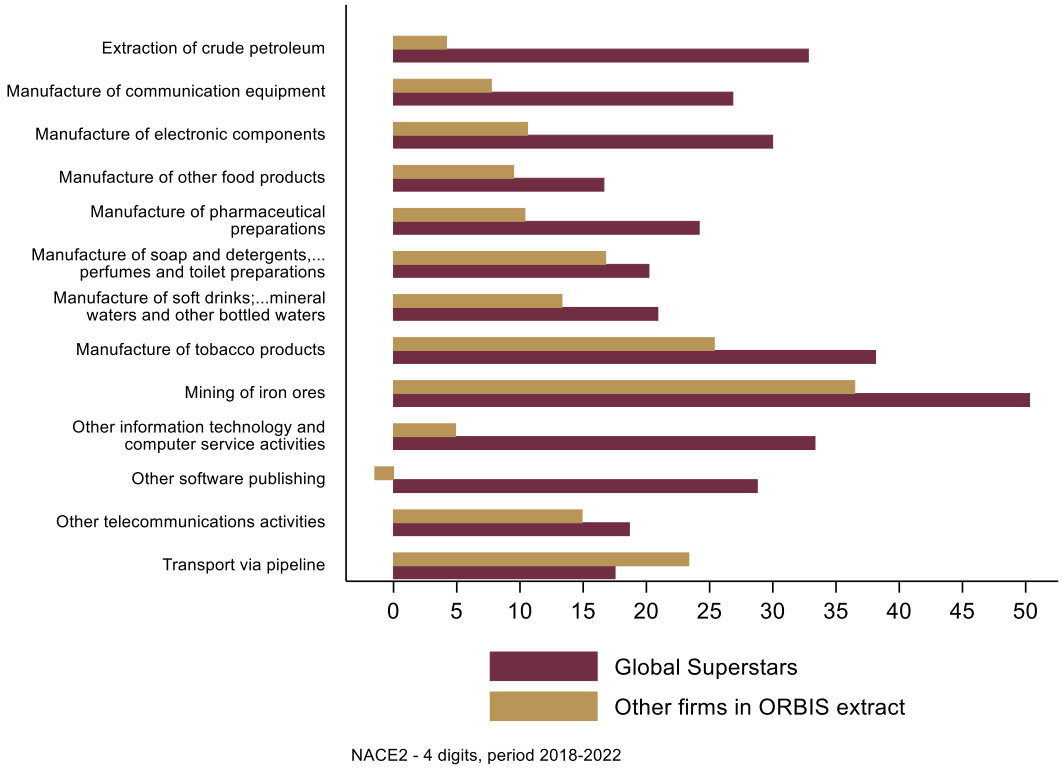
Note: Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Sector "FMCG" is the abbreviation for "Food and Beverages + Tobacco + Household, Personal and Cosmetic Products". Sector "Others" include the following sectors: "Motor Vehicles and Parts", "General Merchandisers", "Specialty retailers", "Entertainment", "Scientific, Photo, Control Equip.", "Forest and Paper Products", "Health Care". Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

The following analyses study the sectors in which the Global Superstars operate. For this purpose, the Global Superstars are compared with about 6,000 global firms, both public and private, which are contained in an extraction from ORBIS, another database. The details of the methodology and the selection of sectors are described in Annex C.4.

Figure 3.15 shows that Global Superstars enjoy higher EBIT margins than other (large)[276] firms in the same sector. This is, in part, a consequence of the selection criteria to select the Global Superstars, as they are selected based on profit rate, but the difference is striking in some sectors.

[276] *Our ORBIS extraction is restricted to companies with revenues higher than 1 billion EUR.*

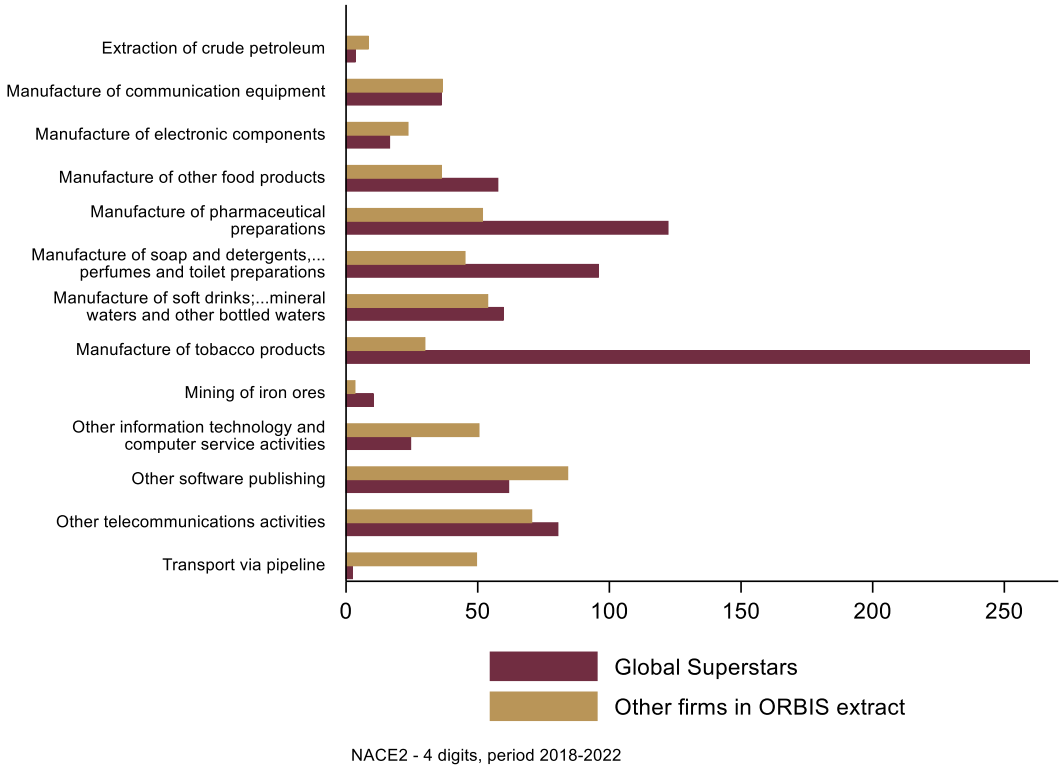
Figure 3.15: Sector analysis—EBIT (% of sales)



Source: Project Team based on ORBIS

Figure 3.16 depicts intangible assets as a percentage of sales. In some sectors, intangible assets of Global Superstars are higher than their revenue, in particular in pharmaceuticals and tobacco. This is also the case to some extent for food products, detergents and soft drinks, which will be considered together with tobacco products as consumer goods. This is consistent with the notion of brand values and their importance for protecting these firms from competition (for a discussion, see section 3.4 on barriers to entry and more specifically section 3.4.3.2).

Figure 3.16: Sector analysis—Intangible assets (% of sales)



Source: Project Team based on ORBIS

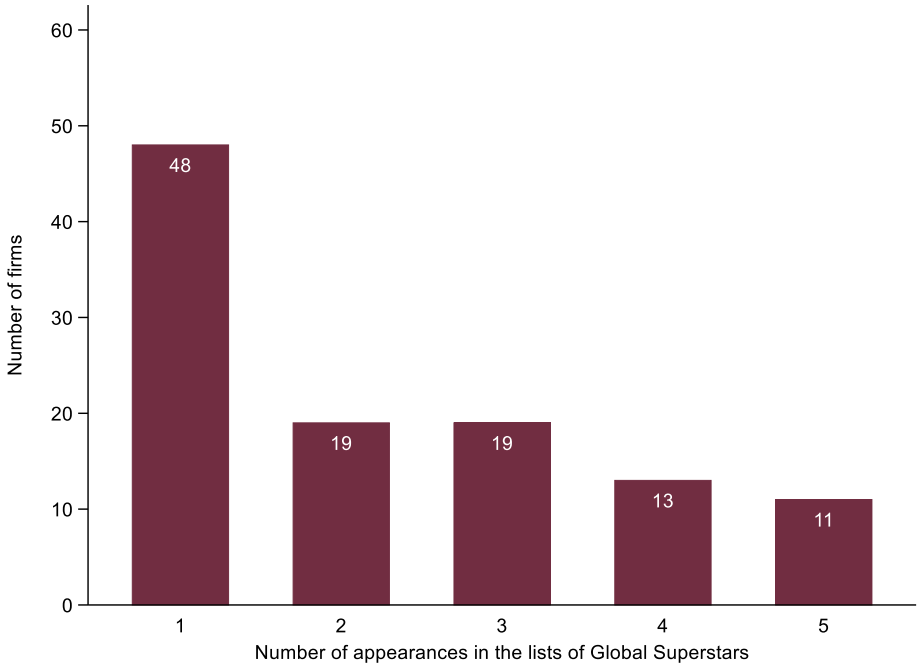
Annex C.4 provides additional statistics on sector characteristics, exploring profit spread, R&D intensity, labour intensity, capital intensity.

3.3.5 Cyclicality and rank persistence

This section first shows the number of appearances of Global Superstars in the ranking, and then studies these dynamics more in detail. These dynamics could reflect firm-level or sector-level expansion and contraction. Indeed, profitability in some sectors of the economy fluctuates more than in other sectors, because the consumption of some goods and services varies more with the overall economy than others. For instance, consumption of basic goods and pharmaceutical products tends to vary less across the economic cycle than the consumption of luxury products.

Figure 3.17 depicts in how many five-year periods a given firm is included in the list of Global Superstars. Of the 110 companies that appear in the list of Global Superstars, 48 (about half of the total) are only listed as Global Superstars in one of the five five-year periods. This suggests that the composition of the Global Superstars changes overtime. 11 firms appear in all Global Superstar lists from 1998-2002 to 2018-2022 and 13 firms appear in four out of five lists, meaning that almost half of the Global Superstars consistently stayed at the top of the distribution.

Figure 3.17: Number of appearances in the list of Global Superstars



Note: As a reading example, 11 firms appear five times in the Superstar list, i.e. they are a Global Superstar in every of the five five-year periods considered. Source: Project Team- Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

The firms that consistently outperform their competitors, appearing in the list of Global Superstars in four or five periods, are listed in Table 3.2. The table is sorted by total number of appearances, and then alphabetically by sector.[277]

[277] *A full list including firms that appear two or three times is available in.*

Table 3.2: Global Superstars with at least four appearances in the five periods

Firm	*Number of appearances*	*Sector*
Microsoft	5	Computer, Softwares
Intel	5	Electronics and Semiconductors
Coca-Cola	5	Food and Beverages
Nestle	5	Food and Beverages
Johnson and Johnson	5	Pharmaceuticals
Merck	5	Pharmaceuticals
Novartis	5	Pharmaceuticals
Pfizer	5	Pharmaceuticals
Roche	5	Pharmaceuticals
Procter and Gamble	5	Soaps, Cosmetics
Philip Morris	5	Tobacco
IBM	4	Computer, Softwares
Gazprom	4	Energy and Utilities
PepsiCo	4	Food and Beverages
Anglo American	4	Mining, Crude-Oil Production
Toyota Motor	4	Motor Vehicles And Parts
Chevron	4	Petroleum Refining
ExxonMobil	4	Petroleum Refining
Petronas	4	Petroleum Refining
AstraZeneca	4	Pharmaceuticals
GlaxoSmithKline	4	Pharmaceuticals
AT&T	4	Telecommunications
China Mobile Communications	4	Telecommunications
Cisco Systems	4	Telecommunications

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

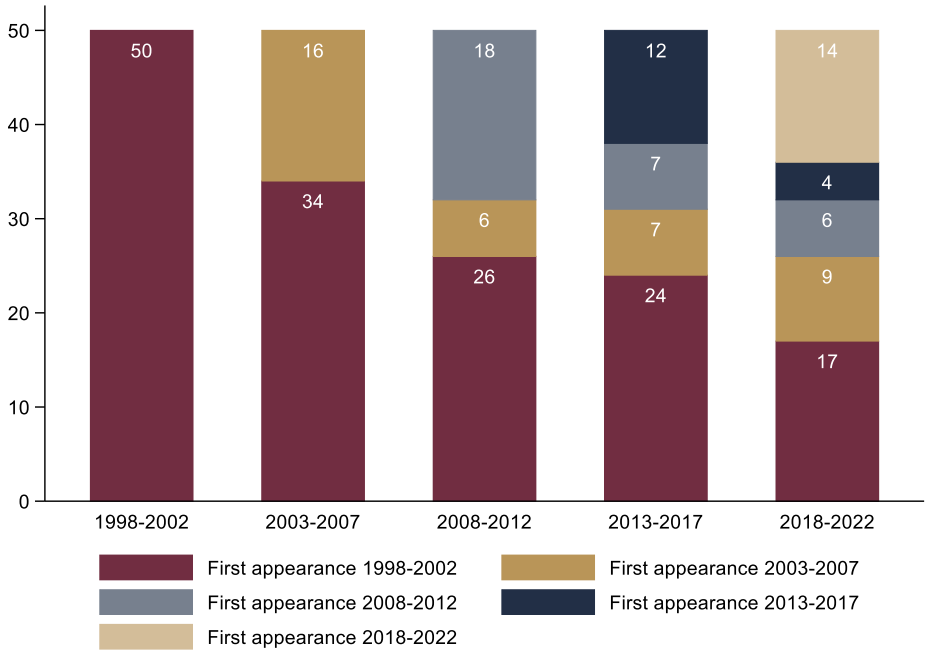
Table 3.2 highlights that only a small number of firms has been able to stay at the very top of the distribution for an extended period. Looking at the sectors in which they are active calls for the following remarks:

- 7 of 24 of the most persistent Global Superstars are active in the pharmaceutical industry.

- The remaining 17 persistent Global Superstars come from different sectors (though some might still compete with each other, e.g. Gazprom and ExxonMobil, which operate in the same field), with Food and Beverages, Petroleum Refining and Telecommunications being most prominent among them.

Figure 3.18 depicts an alternative measure of persistence of Global Superstars. Each colour in the bar chart represents the period in which a firm first entered the Global Superstar list. For example, a red bar represents firms that first appear on the list in 1998-2002 and because 1998-2022 is the first period of analysis, the entire 1998-2002 bar is red. For the period 2003-2007 just over half of the bar is red coloured, meaning that slightly more than 50% of the firms that are in the list of Global Superstars in 2003-2007 appeared on the list in 1998-2002. The light brown bar at the top of the last column shows that only 14 of the Global Superstars had never appeared in the listing in the previous periods.[278]

Figure 3.18: Number of first time Global Superstars in each period



Note: The figure does not track whether a firm disappeared and reappeared. For instance, there are more than 17 firms in the 2018-2022 period that first appeared in 1998-2002. However, not all these companies stayed a Global Superstar the whole time (only 11 firms did). Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

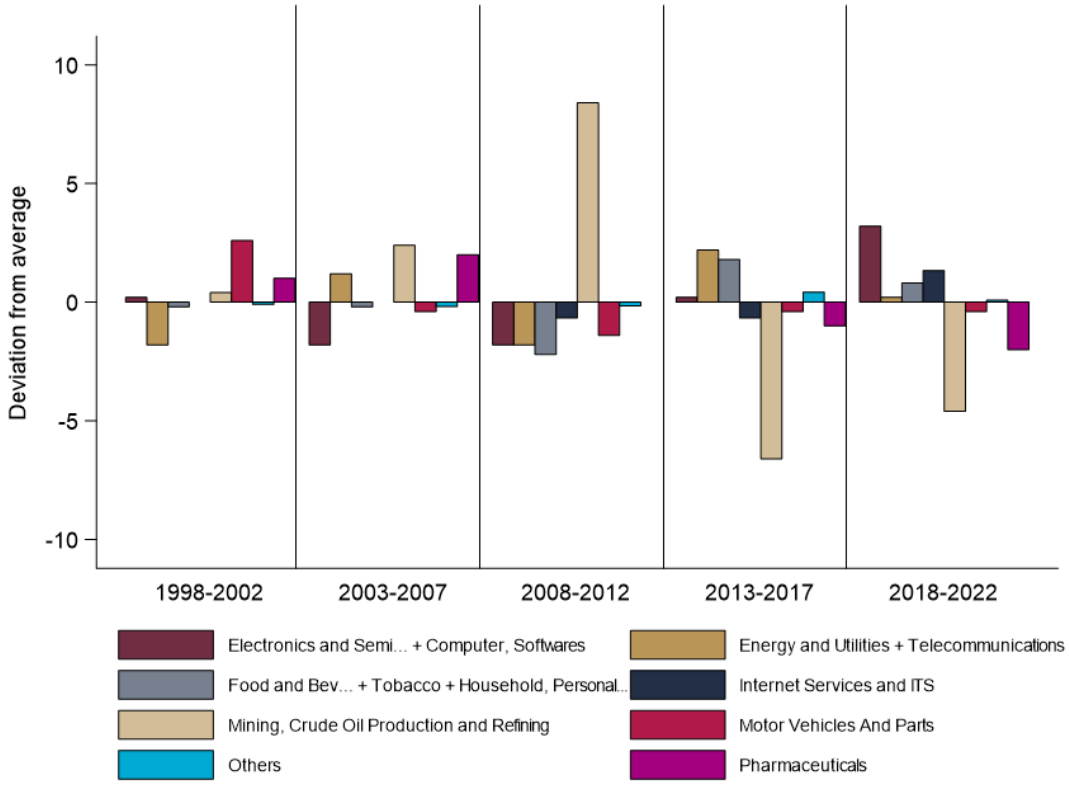
As explained in the introduction of this section, the dynamics of Global Superstar listings could reflect firm-level or sector-level changes, because the variation of profitability can be sector wide or at the firm level, because profitability in some sectors of the economy varies more than in other sectors. To study the sectoral effect, we count the number of Global Superstars in each sector in each five-year period and consider that sectors with

[278] *Note that several firms disappear and reappear on list of Global Superstars, which is not captured by Figure 3.18 (see the note below the figure for details). Table C.4 in Annex C provides the entire history of the status of Global Superstars.*

a relatively constant number of appearances overtime have weaker cyclical patterns than sectors with significant evolutions. We thereafter study whether firms' position in a sector evolves over time.

The following Figure 3.19 provides a measure of cyclicality for a selection of eight sectors in which Global Superstars are particularly prevalent. Figure 3.19 compares the number of Global Superstars in a given period and a given sector with the average number of Global Superstars in that sector.

Figure 3.19: Cyclicality of most common sectors from the Top 50 Global Superstars list



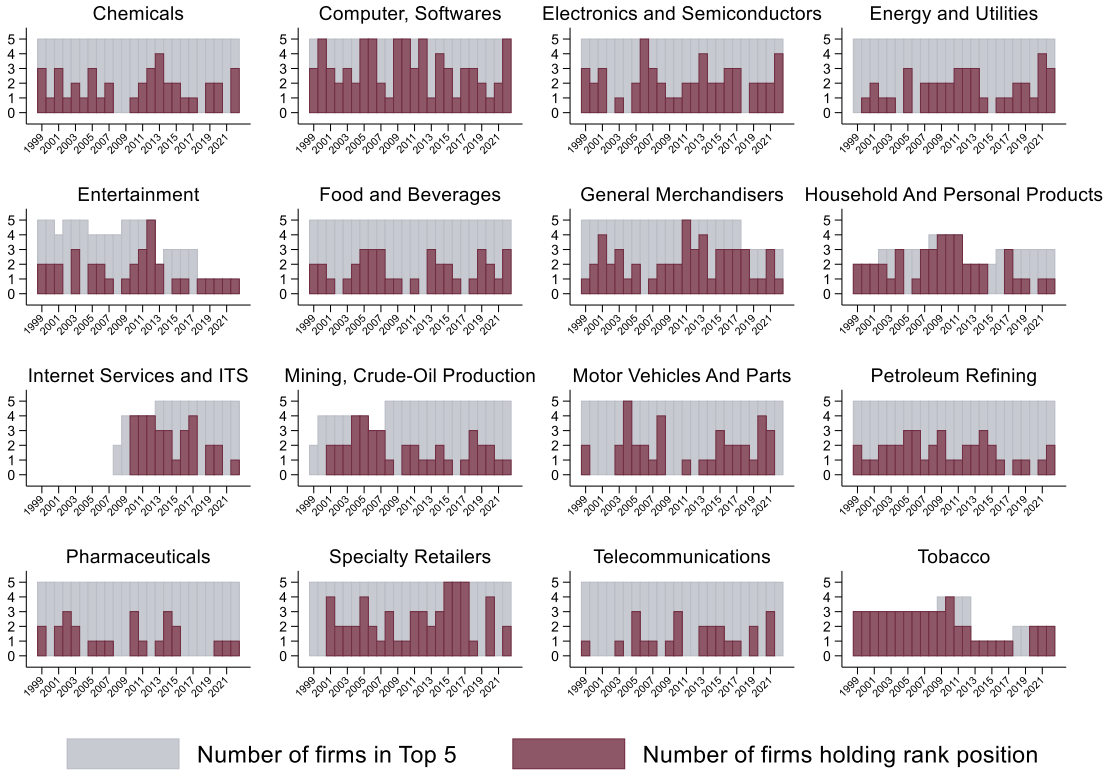
Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Sector "Others" include the following sectors: "General Merchandisers", "Specialty retailers", "Entertainment", "Scientific, Photo, Control Equip.", "Forest and Paper Products", "Health Care". Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

The number of Global Superstars in a given sector is rather stable for most sectors, but one sector stands out: The "Mining, Crude Oil Production and Refining" sector appears predominantly in the rankings of Global Superstars until 2012, and its relevance decreases significantly thereafter.

Figure 3.20 studies whether firms that are highly ranked in their sectors keep their position overtime. The grey bar reports the number of top-5 firms in a given sector (as ranked by the composite index, irrespective of whether a firm is a Global Superstar). Some sectors contain less than five firms in the Fortune Global 500 list: for example, the grey bar for the Tobacco sector in 2019 has a height of two because there are only two firms in the 2019 Fortune Global 500 that are assigned to that sector.

The dark red bars show the number of the top-5 firms that keep their position within the top-5 ranking from one year to the next. A higher bar means that the ranking of firms in a given sector is rather stable.

Figure 3.20: Rank persistence



Note: All values are in 2022 US dollars - adjusted using IMF world consumer price index. Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.20 indicates that rank persistence varies substantially between sectors. The average rank persistence score from 1999-2022 in the Telecommunications sector is one, which means that only one firm out of the top-5 maintains the same rank as in the previous year, while in the Computer and Software sector the average is three, meaning that, on average, three out of five firms in the top-5 maintain the same ranking as in the previous year. Tobacco stands out in the figure: there are less than five Tobacco firms in the Fortune Global 500 database, but these firms keep their ranking almost every year.

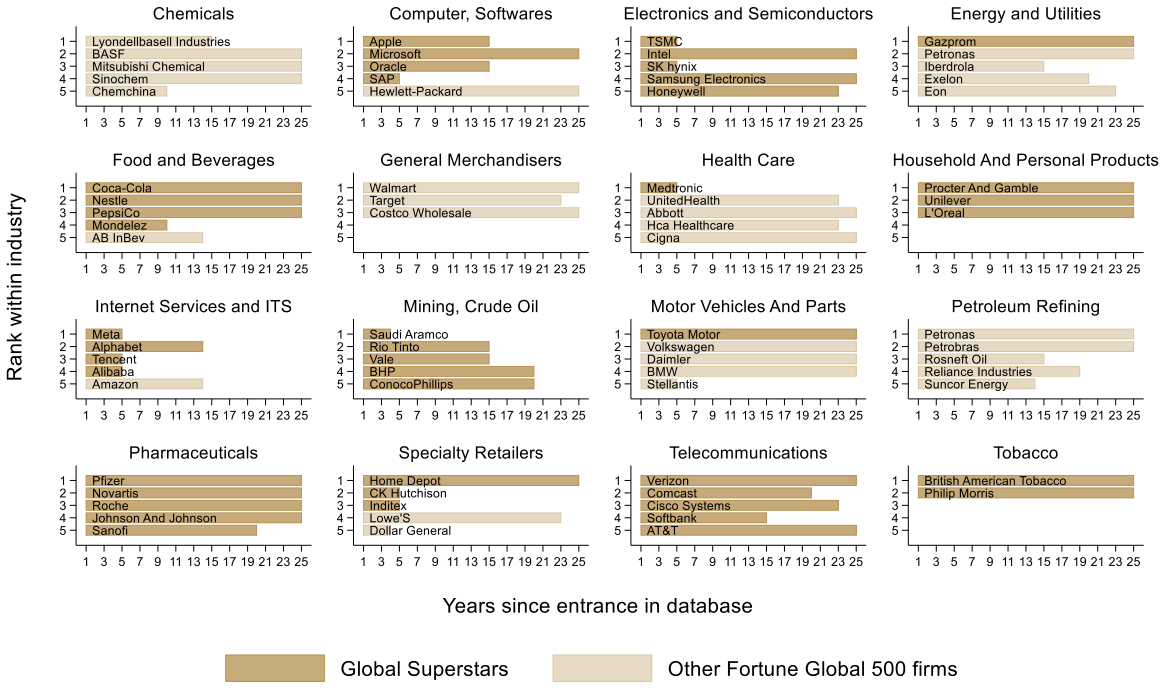
The analysis depicted in Figure 3.21 studies how long firms have been listed in the Fortune Global 500 database, with a focus on firms that are ranked highest within their industry (according to the composite index). We report the number of years between a firm's first appearance in the Fortune Global 500 database and the year 2022. The maximum number of years of presence in the Fortune Global 500 database is 25 since

the period of observation starts in 1998. The minimum is 5 and applies to firms that are only present in the latest five-year period.[279]

The number of years of presence in the Fortune Global 500 database echoes rank persistence. When a firm at the top of its industry has not been listed for long in the Fortune Global 500 database it means that the firm in question has grown to become one of the largest in its industry, which shows some dynamism in the industry. Conversely, if the firm has appeared for long in the Fortune Global 500 database, it shows stability in the industry in question.

In Figure 3.21, the firms that are Global Superstars in the last period (2018-2022) are depicted in dark gold and the firms that do not qualify as Global Superstars are in light gold. For example, in the Chemical sector, none of the top-5 firms listed in the figure are Global Superstars in the last period, while all firms in the Electronics and Semi-conductors sector are Global Superstars in the last period.

Figure 3.21: Number of years a top-5 firm has appeared in the Fortune Global 500 dataset by sector (2018-2022)



Note: Sectors with missing entries are due to Fortune Global 500 containing less than five firms for that sector in period 2018-2022. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.21 shows that in some sectors most top-5 firms have been listed in Fortune Global 500 for decades, while other sectors have been more dynamic. Top-5 firms have a longer history in Fortune Global 500 in "Household and Personal Products", "Pharmaceuticals" and "Tobacco" sectors. In these sectors, most of the top-5 firms were

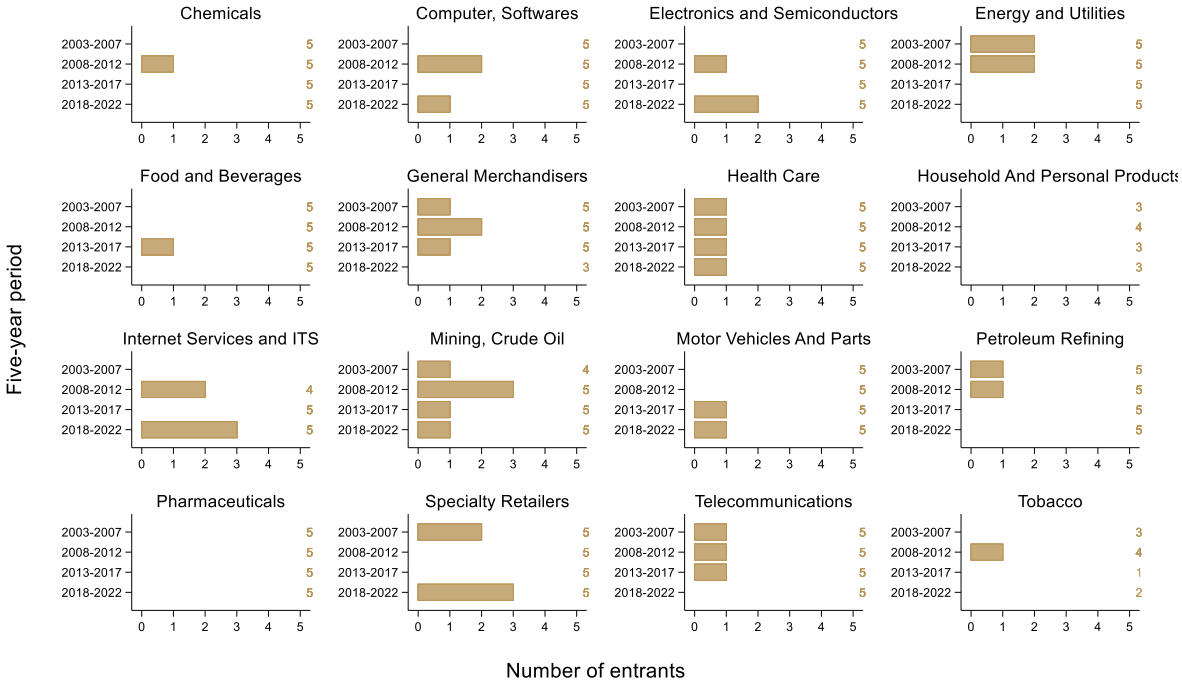
[279] *As for Figure 3.18, the analysis does not track whether a firm disappeared and reappeared in the dataset.*

also Global Superstars. In "Chemical", top firms also entered Fortune Global 500 decades ago, but none is a Global Superstar.

In sectors with disruptive technological progress, such as "Specialty Retailers", "Computer, Softwares" and "Internet Services and ITS", less established firms make it to the top.

Following up on the previous analysis, the following exercise looks at "entrants". For this purpose, an "entrant" is defined as a top-5 firms that entered Fortune Global 500 less than 5 years before the given period (measured by the difference between the last year of each five-year period (e.g., 2007, 2012, 2017, 2022) and the first year of appearance in Fortune Global 500 dataset). Figure 3.22 show the results. It also reports the number of top-5 firms on the right of the graph (this number is lower than 5, when the Fortune Global 500 database does not contain five firms for the sector in the relevant period).

Figure 3.22: Number of "entrants" in the top-5 per sector



Note: An "entrant" is defined as a top-5 firms that entered Fortune Global 500 less than 5 years before the given period. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.22 confirms the findings of Figure 3.21: well-established firms dominate "Household and Personal Products", "Pharmaceuticals" and "Tobacco", which are characterised by low rates of entry, while more entrant firms make it to the top-5 in other sectors.

3.4 Barriers to entry

Well-functioning markets deliver low prices, high quality and innovative products. They are also able to meet increasing demand for a good or service, through what economists call the elasticity of supply (i.e., price increases are met by increasing supply of goods and services). Increasing supply can in principle be provided by incumbents or entrants.

Entrants are key for market functioning because they not only help to meet increasing demand, but they also help generate low prices and high quality, by constraining incumbents. Entrants are also more likely to rely on disruptive technologies.

This section of the report discusses whether and how barriers to entry protect Global Superstars from entrants. We will first define barriers to entry, and then explore more specifically whether they have a role in three sectors where Global Superstars are most active, namely consumer goods, IT and pharmaceuticals.

The analysis in this section is more qualitative than other sections of this chapter. As will be explained hereunder, barriers to entry can only be identified and assessed for specific geographic and product markets. But, by definition, the activities of Global Superstars (which are the subject of this chapter of the report) span across a wide range of product and geographic markets. Hence, we cannot undertake the market-by-market analysis that would be required to identify the relevant barriers to entry but will instead discuss these barriers to entry at a more aggregate level and provide some reasoned opinions on the set of most relevant barriers to entry at a sectoral level.

3.4.1 Barriers to entry in the Horizontal Merger Guidelines

In general, entry is likely if sufficiently profitable, accounting not only for price effects of injecting additional output on the market but also for the potential responses of the incumbents. Incumbents are constrained by the entry of rivals whenever they increase prices, reduce quantity, decrease quality or innovation. If entry barriers are low, profits of incumbent firms will induce entry. Conversely, entry barriers make markets less contestable, through the advantages that incumbents enjoy over potential competitors.

Barriers to entry are therefore a crucial component of market functioning, and a key element of competition investigations. The European Commission's Horizontal Merger Guidelines define (para 70) barriers to entry as specific features of the market which give incumbent firms advantages over potential competitors, and categorise entry barriers in three groups (para 71):

1. Legal advantages: Legal advantages arise when regulatory barriers limit the number of market participants by, for example, restricting the number of licenses or requiring fulfilling a long and burdensome list of regulatory obligations to enter the market. They can also relate to long term contracts, exclusivity rights, intellectual property rights and others that prevent competitors from accessing to the relevant inputs to compete effectively on the market.
2. Technical advantages: Technical advantages refer to advantages such as preferential access to essential facilities, important technologies, natural resources, innovation and R&D, or intellectual property rights, economies of scale and scope, as well as network effects. Note that these advantages can derive from legal advantages such as long-term contracts.
3. Established position and strategic behaviour: Experience and/or reputation are often required to compete effectively in the market. But experience and reputation may be difficult or take time to obtain, especially when consumers do not switch easily, for instance because they are locked-in by switching costs or long-term contracts. These barriers can be created and/or amplified by consumers' behaviour and by incumbents:
    a. barriers to entry amplified (indirectly) by consumer behaviour are often the consequence of behavioural biases, which prevent consumers to access the relevant information, process the information or act on it. For example, consumers do not seek to compare prices between providers, or are unable to properly assess the information made available or accept terms and conditions

without reading them properly. Human factors may therefore contribute to create or reinforce entry barriers affecting market outcomes;

b. barriers to entry created by incumbents include behaviours such as building excess capacity, over-investing in advertising and other intangible assets, keeping an excessively close relationship with customers, and engaging in other behaviours that make it more difficult for customers to switch suppliers.

Note that these categories are not strictly mutually exclusive. Legal advantages and technical advantages could also be the consequence of a "strategic behaviour", if for instance clients are tied to long-term contracts by strategic behaviours. The same argument extends to exclusive rights and to some extent to R&D and IP rights.

3.4.2 Barriers to entry and Global Superstars

3.4.2.1 A categorisation of barriers to entry

Broadly speaking, barriers to entry refer to *impediments*, usually higher costs, that make it more difficult (or even impossible in case of legal monopolies) for a firm to enter a market. But what exactly constitutes an entry barrier is a subject of discussion among economists. The controversy is about which types of impediments qualify as barriers to entry: economies of scale, product differentiation, access to capital and intangible assets, access to inputs and intellectual property, access to distribution channels, regulatory or government policies and other cost (dis)advantages have all been considered entry barriers, but there is no agreement on whether *all* these factors constitute entry barriers and why.

Bain (1956) was one of the first academics investigating the concept of entry barriers and attempting to elaborate a precise definition. He defines an entry barrier as an advantage of an incumbent, which allows the incumbent to raise prices above competitive levels without fostering entry from newcomers, which would force it to decrease prices to competitive levels over time. Bain described three main barriers that can prevent entry: (i) economies of scale, (ii) product differentiation, and (iii) absolute cost advantages.

Stigler (1968) defined an entry barrier as a cost advantage of incumbents over entrants. According to this definition, with equal access to technologies, scale economies are not considered entry barriers, and neither are capital requirements (unless incumbents never incurred these costs). After Stigler's contribution, contrasting that of Bain, the role of economies of scale and capital requirements has remained at the centre of the debate of economists and antitrust lawyers. A number of studies proposed different definitions and attempted to solve the controversy of whether scales economies and capital costs constitute barriers to entry.

McAfee et al. (2004) present a comprehensive summary of the evolution of this debate. Starting from Bain's definition, they list seven main definitions of barriers to entry, covering almost thirty years of research. The authors attempt to summarise and consolidate the previous definitions, and propose a classification for entry barriers that distinguishes between economic entry barriers and antitrust entry barriers:

- *Economic barriers* are identified as a cost that must be incurred by a new entrant and that incumbents do not or have not had to incur. This definition follows the approach of Stigler;
- *Antitrust barriers* to entry are costs that delay entry and thereby reduce social welfare relative to immediate but equally costly entry.

According to the authors, all economic barriers to entry are also antitrust barriers, but many antitrust barriers to entry are not economic barriers. Antitrust barriers to entry are therefore a larger category. When free entry enables an efficient number of firms to

enter the market, in the absence of antitrust barriers to entry, one can expect an efficient market outcome. In the absence of economic barriers to entry, the market outcome could be efficient, after some delay.

McAfee et al. (2004) further distinguish between *primary* and *ancillary* barriers:

- *Primary barriers* are costs that constitutes a barrier to entry on their own;
- *Ancillary barriers* are costs that do not constitute a barrier to entry by themselves, but reinforce other barriers to entry, when they are present.

3.4.2.2 The role of economies of scale and access to capital

Economies of scale and access to capital are particularly relevant for Global Superstars. These firms are, by selection, at the very top of the distribution of turnover and profits, which means that if economies of scale and access to capital play a role in an industry, Global Superstars will produce at a distinctively larger scale and have access to significantly more capital than entrants.

According to the classification of McAfee et al. (2004), economies of scale and access to capital are ancillary barriers to entry and not primary entry barriers. The authors argue that economies of scale and access to capital do not deter entry *by themselves*.

For instance, brand loyalty has the capacity to block entry and economies of scale reinforce this effect. But, if a firm enters at scale, the incumbent will lower its output to prevent its profits from falling to zero. Importantly, the entrant can only reach the required scale if enough customers switch from the incumbent to the entrant. If instead costumers are unable or unwilling to switch (e.g., because of brand loyalty), then the entrant will not be able to gain sufficient market shares to produce at the right scale (or to gain them sufficiently quickly). Accordingly, economies of scale reinforce the effect of brand loyalty. The latter is therefore the primary barrier and the former an ancillary barrier to entry.

A similar argument applies to access to capital. McAfee et al. (2004) classify access to capital as an ancillary barrier, while the primary barrier is the reputation necessary to raise capital. If capital markets are efficient, a firm should be able to raise capital if future revenues are larger than costs—and enter at the required scale. When reputation is an important factor in competition, large capital costs make it difficult or impossible to test the market, since the entrant must commit significant resources to enter. In such a setting, the threat of aggressive behaviour by the incumbent may deter entry. According to McAfee et al. (2004), capital access is not an economic barrier either, since incumbents had to bear capital costs in the past that are similar in size to those that entrants have to bear today, but it may be an antitrust entry barrier.

While there is little doubt that the reasoning of McAfee et al. (2004) on primary and ancillary barriers to entry applies to entry on an average market, one can discuss whether it also applies to Global Superstars. Indeed, if economies of scale and access to capital may be of secondary importance to enter an average firm's market, it might not be the case when trying to compete on a much larger scale. Global Superstar are, by selection, very different from an average firm, and what is true for an average firm may not be true for a Global Superstar. This is especially the case for scale: it is different to try and reach the scale of an average firm and to try and reach the scale of one of the world's largest firms.

Therefore, barriers to entry that protect Global Superstars may differ from barriers to entry that protect their smaller competitors. But the effect of scale at a global level should be assessed on a case-by-case basis, because entry on the market (or entry on one of the markets) of a global firm does not necessarily require operating at a global scale because, in some cases, smaller firms can compete with global firms on a smaller relevant geographic market.

3.4.2.3 Institutional aspects

Well-functioning and reliable institutions (e.g., government and regulators, but also banks and insurances for instance) are crucial to grant access to the relevant resources to enter a market. It has been argued that institutional factors and policy frameworks can play a more prominent role to make entry more or less easy for new competitors on markets dominated by Superstar firms. Superstar firms are not average firms, and to compete with them, entrants need to be able to access relevant amounts of capital, both tangible and intangible. As discussed in section 3.1, some authors suggest that regulatory and government policies may have favoured Superstar firms vis-à-vis new entrants (see e.g. Gutiérrez and Philippon (2017), Andrews et al. (2016)).

This evidence is also indirectly supported by Calvino et al. (2020). The study analyses trends in business dynamism across 18 countries and 22 industries over the period 2000-2015 using novel data from the OECD Dynemp projects. The analysis focused mainly on two common indicators of business dynamism: entry and job reallocations. Together with structural factors, the authors identify a set of institutional characteristics and framework conditions favouring business dynamism. The five categories considered are: i) strength of regulatory barriers and policies levelling the playing field, (ii) the efficiency of bankruptcy procedures and contract enforcement, (iii) access to finance, (iv) innovation, and (v) human capital. The study concludes that high regulatory barriers amplify declines in entry, while efficient judicial and bankruptcy systems, lower gaps in interest rates between firms of different size, policies enhancing innovation and higher spending in innovation all contribute to increase entry rates (or to slow down the declines in entry rate). These conclusions are not specific to Superstar firms but prove the importance of well-functioning institutions to favour the contestability of the markets where Superstar firms operate.

3.4.2.4 Role of intangible assets and access to data

As discussed in section 3.1, a driver of the rise of Superstar firms is the increase in investments in intangible assets. Corrado et al. (2009) identify three main categories of business intangibles: computerized information, innovative property and economic competencies. Examples of items in these three categories include software, scientific R&D, and brand values, respectively.

Crouzet and Eberly (2019) underline how the differences between intangible capital and physical capital may indirectly create new barriers to entry. Since a piece of software can be more easily replicated than a piece of equipment, the ownership becomes less palpable and more contractual, requiring patent and copyright protection, as seen in intellectual property and software. Similarly, investment in branding and business processes, such as platforms and order systems, may be readily scalable but protected by trademarks. These elements allow to increase economies of scale, while protected by patents and copyrights, and may help excluding competitors.

Akcigit and Ates (2023) analyse US patent data and they do not only find increasing concentration of patent ownership, but also evidence that patents are increasingly used strategically. According to their analysis, the share of patents registered by firms in the top 1% of patent owners increased from 35% in the mid-1980s to 50% in the 2010s. In terms of strategic use of patents, the authors consider that self-citing patents (i.e., new patents that cite patents from the firms' own patent portfolio) aim to protect the

firm's core technology. They find evidence that self-citation in new patents increased since the beginning of the century.[280]

Bessen (2020) argues that proprietary software allows firms to compete more on the complexity and differentiation of their products, which leads to reduced technological diffusion as firms lack incentive to license their highly differentiated software to rivals, and to reduced industry dynamism. At the same time, intangible assets have different weight depending on the sector under consideration. Crouzet and Eberly (2019) also highlight that investment in intangible capital has grown in the consumer sector, which was transformed by process innovation (e.g., inventory and distribution methods, online platforms), and in the healthcare sector, where patentable product innovations are more relevant.

The role of intangible assets is also highlighted in an OECD study by Bajgar, Criscuolo and Timmis (2021). The authors find empirical evidence for a correlation between investment in intangible assets and industry concentration. They also find that increasing concentration comes with less dynamics at the top end of the distribution of firms. Similar to Akcigit and Ates (2023), but using European data, Bajgar, Criscuolo and Timmis (2021) find evidence that the largest firms are increasingly filing self-citing patents "intended to impede competition rather than to explore new technology" (Bajgar, Criscuolo and Timmis, 2021, p. 30).

As shown in section 3.3, a portion of Global Superstars operate in digital markets. For these sectors, scale economies and (direct and/or indirect) network effects are particularly relevant. As emphasized by a number of reports on digital markets[281] some (digital) sectors are not only characterised by extreme returns to scale (where the cost of production is much less than proportional to the number of customers served) but also by (indirect) network effects and advantages deriving from the access to data.

The winner in these settings has massive cost advantages from its scale operations, and massive benefits from the scale of its data. An entrant cannot generally overcome these barriers without either a similar installed base (network effects) or a similar scale, both of which cannot be reached quickly and cost-effectively. Some have argued that entrants with these characteristics are already existing digital companies or platforms, which enter a new market. According to the Stigler Committee on Digital Platforms report by Scott Morton et al. (2019), such entrants are capable of creating effective competition for an incumbent platform, which ultimately benefits consumers. One type of intangible asset, which is particularly relevant in digital markets is access to data resources. Using the words of Scott Morton et al. (2019): "The same effects that drive the quality of digital services higher as more users join—a positive feedback loop—makes the strong stronger and the weak weaker". Data feeds the development of algorithmic and AI training processes that enables more profitable exploitation of consumer attention through advertising. This data advantage enables a virtuous cycle: more data allows better service, an improved service attracts more users and increases scale, and hence makes the company able to gather more data.

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[280] The authors describe such patents as "internal". In contrast, they argue that "external" patent, those that mostly cite patents outside the firm's existing portfolio, aim to expand into new fields.

[281] See for example J. Crémer, Y.A. de Montjoye YA and H. Schweitzer, "Competition Policy for the Digital Era", Report to the European Commission, 2019; J. Furman, D. Coyle, A. Fletcher, D. McAuley, P. Marsden, "Unlocking Digital Competition," Report of the Digital Competition Expert Panel, 2019; F. Scott Morton, P. Bouvier, A. Ezrachi, B. Jullien, A. Katz, G. Kimmelman, D. Melamed, D.J. Morgenstern, Committee for the Study of Digital Platforms, Market Structure and Antitrust Subcommittee, Stigler Center for the Study of the Economy and the State, 2019.

Data being increasingly prevalent beyond the pure digital markets, access to data becomes ever more relevant in a broad range of industries. As access to data becomes more important, entrants experience the reverse of the virtuous cycle just described. The difficulty to access data does not allow to improve the products and slows down the path to reach a sufficient scale, which itself is a condition to data gathering. An entrant starved of data, relative to a Global Superstar, risks being at serious competitive disadvantage.

3.4.3 Entry barriers in consumer goods, IT and pharmaceutical sectors

We have explained above that entrants constrain incumbents' desire to increase prices and reduce quantity or quality, unless they face (significant) barriers to entry. This section explores whether and to what extent the rise of Global Superstars—most profitable among the world's largest revenue-generating companies—and/or their persistence in that status has been favoured by barriers to entry.

As explained in the introduction of the section, the relevant barriers to entry can only be identified for specific markets and the activities of Global Superstars typically cover a wide range of product and geographic markets, which makes the required market-by-market analysis impossible. We will therefore discuss barriers to entry at a more aggregate level focusing on three sectors where many Global Superstars are active, namely consumer goods, IT and pharmaceuticals.[282]

These sectors have come to our attention for several reasons. First, they are the most relevant sectors as they are the ones in which a significant number of Global Superstars are active (see Figure 3.23). Second, these sectors are also interesting from a competition perspective, as they have been subject to a significant number of merger proceedings and competition investigations. Figure 3.23 and Figure 3.24 show that Global Superstars active in these sectors have been the subject of more intense scrutiny by competition authorities (note that, as explained below, these statistics should be interpreted carefully). Third, barriers to entry in these sectors are different in nature and possibly in effectiveness. As explained in further detail in section 3.3.5, in the consumer goods and pharmaceuticals sectors, Global Superstars are highly persistent, while entrants play a stronger role in the IT sector (which does not mean that entrants are not protected by entry barriers after their successful breakthrough). Moreover, the most relevant barriers to entry in each of these sectors are very different.

Figure 3.23 depicts the number of Global Superstars per sector and, for each sector, the proportion of Global Superstars that have filed a merger to the European Commission that resulted in an intervention after the merger investigation (these interventions include prohibitions, remedies and the withdrawal of the merger following the investigation). It is important to note that these statistics should be interpreted carefully, as merger proceedings, by definition, target larger companies and merger review does not imply any wrongdoing.

Figure 3.23 shows that the proportion of Global Superstar that experienced an intervention in merger control is higher in pharmaceuticals, the consumer goods, and IT sectors (Electronics and Semiconductors + Computer, Softwares + Internet Services

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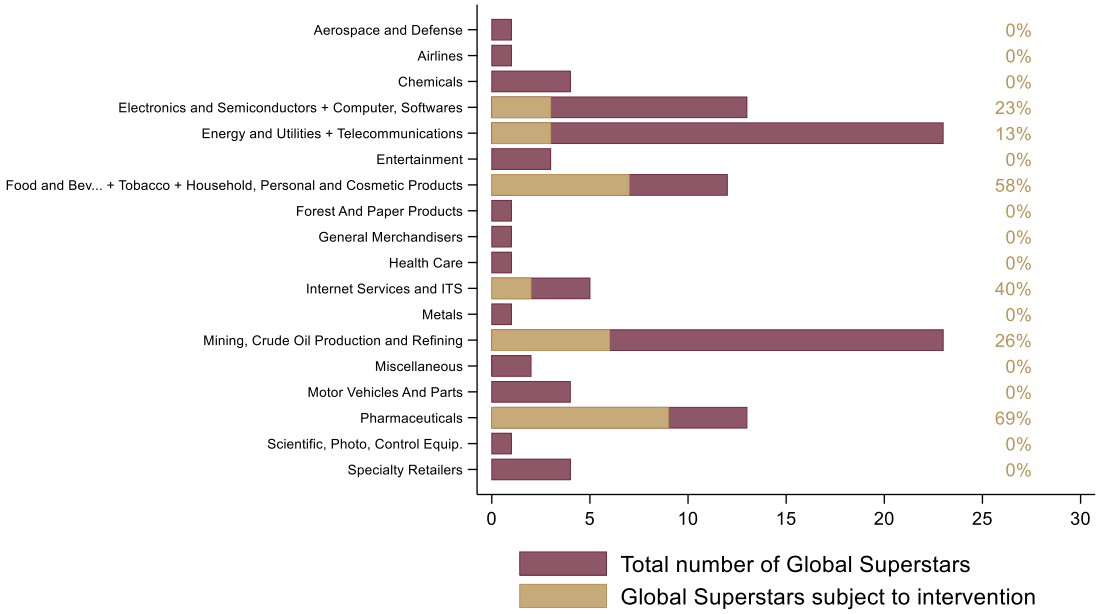
[282] The consumer goods sector comprises of the Fortune Global 500 industries: "Beverages"; "Food"; "Food and Drug Stores"; "Food Consumer Products";" Food Production"; "Food Services"; "Food: Consumer Products"; "Food: Production"; "Food: Services"; "Household and Personal Products"; "Soaps", "Cosmetics"; "Tobacco". The IT sector consists of the Fortune Global 500 sectors "Computer and Data Services"; "Computer Services and Software"; "Computer Software"; "Computers", "Office Equipment"; "Electronics, Electrical Equipment"; "Electronics, Semiconductors"; "Semiconductors and Other Electronic Components". The pharmaceutical sector comprises of the Fortune Global 500 sector "Pharmaceuticals".

and ITS), where respectively 69%, 58% and 63% of the Global Superstars have experienced an intervention. Other sectors where this proportion is important are the Mining, Crude Oil Pruduction and Refining sector (26%) and Energy and Utilities + Telecoms (13%). In all remaining sectors, less than 10% of the Global Superstars experienced an intervention.

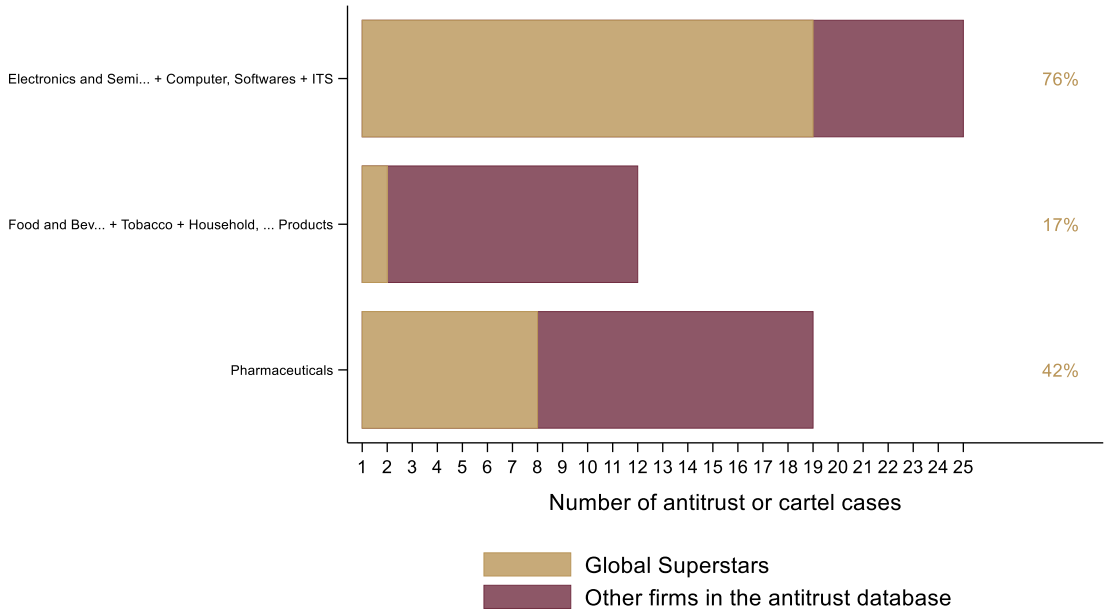
Figure 3.23: Proportion of Global Superstars that experienced an intervention in EC merger proceedings across sectors



Note: Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission. Additional data provided by DG COMP.

Figure 3.24 shows the proportion of art. 101 and art. 102 investigations by the European Commission that concern a Global Superstars in the consumer goods, IT and pharmaceutical sectors. These numbers should again be interpreted carefully as investigations do not necessarily conclude that the companies investigated have infringed competition law. The proportion of antitrust investigations that concern Global Superstars is high in the pharmaceutical sector (42%), and even higher in the IT sector (76%). It is instead lower for the consumer goods sector (17%).

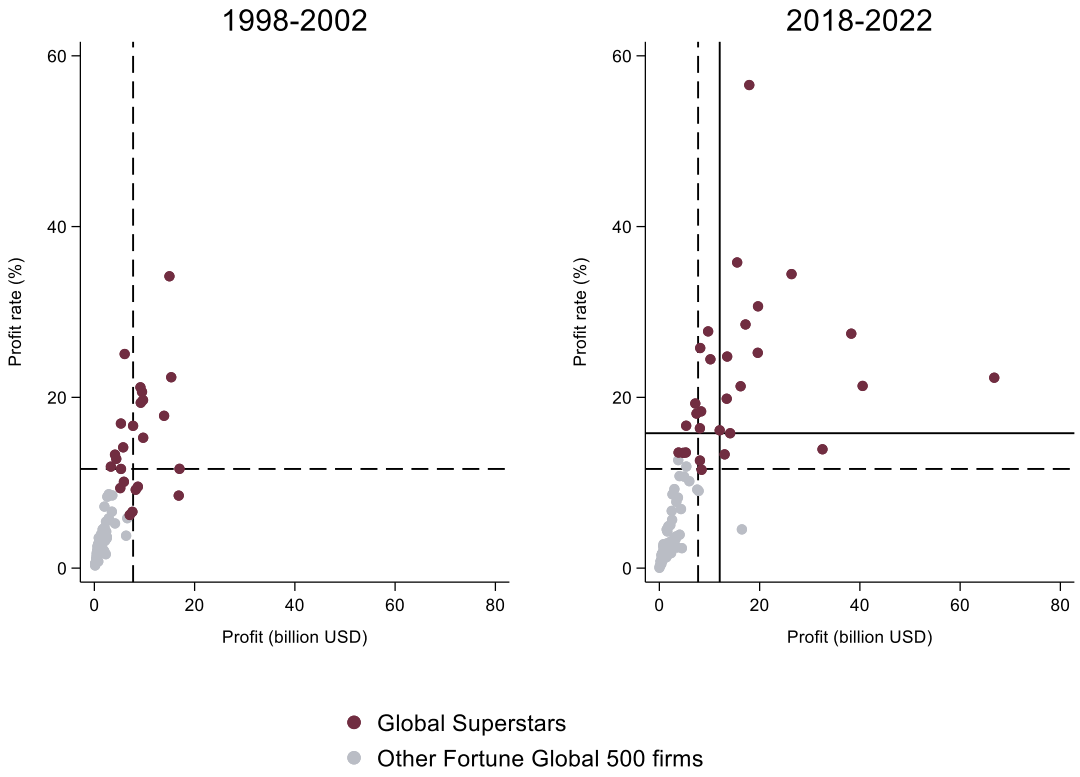
Figure 3.24: Proportion of EC antitrust investigations that concern a Global Superstars in the consumer goods, IT and pharmaceutical sectors



Note: Sectors are based on Fortune Global 500, which differs from the NACE classification system. A "+" between sectors indicates that we combined the respective sectors. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission Additional data provided by DG COMP.

Finally, like in other sectors, the profit and profit rate of Global Superstars in the consumer goods, IT and pharmaceutical sectors have increased tremendously over the last two decades. Figure 3.25 shows the evolution of profit and profit rate of Global Superstars in these sectors.

Figure 3.25: Evolution of profit and profit rate of Global Superstars in the consumer products, IT and pharmaceutical sectors



Note: Firms with negative average profit are excluded from the figure to improve readability. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Table 3.3 presents the top-five Global Superstars in the consumer goods (CG), IT and pharmaceutical (PH) sectors in each of the five five-year periods. The firms that already belonged to the top-four Global Superstars in their respective sectors in the previous five-year period are highlighted in red (note that all figures reported are based on four five-year periods). Table 3.3 illustrates the persistence at the top-end of the distribution, given that 60% of the cells are highlighted in red. Hence, 60% of the top-four Global Superstars were already among the top-five in the previous five-year period, which shows that there is significant persistence at the top-end of the distribution of revenue and profits, especially in the Pharmaceutical sector, where this proportion raises to 65%. This analysis complements the results illustrated in Figure 3.21 which showed that top-5 firms are well-established and long term-operating firms, especially in the "Household and Personal Products", "Pharmaceuticals" and "Tobacco" sectors.

Table 3.3: Persistence of Global Superstars in the consumer goods, IT and pharmaceutical sectors

Sector	*Rank*	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
IT	1	Microsoft	Microsoft	Microsoft	Apple	Apple
IT	2	Intel	Intel	Alphabet	Oracle	Microsoft
IT	3	IBM	Samsung Electronics	Oracle	Microsoft	Meta
IT	4	Philips	IBM	Apple	Alphabet	Alphabet
IT	5	Nokia	Canon	Intel	Intel	TSMC
CG	1	Philip Morris	Philip Morris	Philip Morris	Philip Morris	British American Tobacco
CG	2	Coca-Cola	Coca-Cola	Nestle	Ab Inbev	Philip Morris
CG	3	Procter and Gamble	Procter and Gamble	Coca-Cola	McDonald's	Coca-Cola
CG	4	McDonald's	Pepsico	Procter and Gamble	Coca-Cola	Procter and Gamble
CG	5	Nestle	L'Oreal	British American Tobacco	Procter And Gamble	Nestle
PH	1	Merck	Pfizer	Astrazeneca	Pfizer	Pfizer
PH	2	Glaxosmithkline	Glaxosmithkline	Johnson and Johnson	Johnson and Johnson	Novartis
PH	3	Eli Lilly	Johnson and Johnson	Novartis	Novartis	Roche
PH	4	Bristol-Myers Squibb	Merck	Merck	Roche	Johnson and Johnson
PH	5	Novartis	Novartis	Roche	GlaxoSmithKline	Sanofi

Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

We will now turn to more detailed statistics on profit and geographical origin of Global Superstars in the consumer products, IT and pharmaceutical sectors and some statistics on antitrust investigations in these sectors, before turning to a description of the most relevant barriers to entry in these sectors.

3.4.3.1 Summary statistics

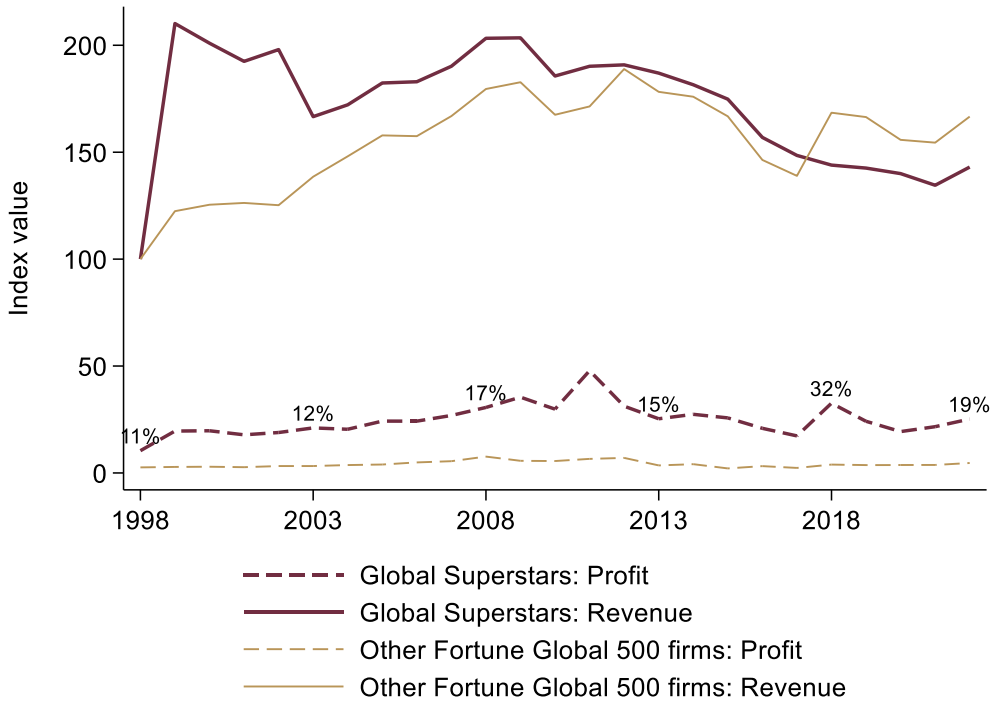
This section provides some summary statistics on the consumer products, IT and pharmaceutical sectors. The sector allocation is based on the classification provided by Fortune Global 500, which takes a consumer perspective, trying to identify in which sector a given company generates the bulk of its turnover (see section 3.3.4).

Global Superstars in the consumer goods sectors

The consumer products sector—or the fast-moving consumer goods sector—aggregates the Food and Beverage sector, the Tobacco sector and the Household, Personal and Cosmetic Products sector. Figure 3.26 depicts the development of the average profit and revenue of Global Superstars compared with the average profit and revenue of the

other Fortune Global 500 firms in the consumer products sector (the average revenue is normalised to 100 in 1998 and adjusted for inflation). Profit is scaled to reflect the size of average profit relative to average revenue in a given year. While average revenues of Fortune Global 500 firms of the consumer goods sector have not evolved significantly differently, profits of Global Superstars in the sector have risen significantly more.

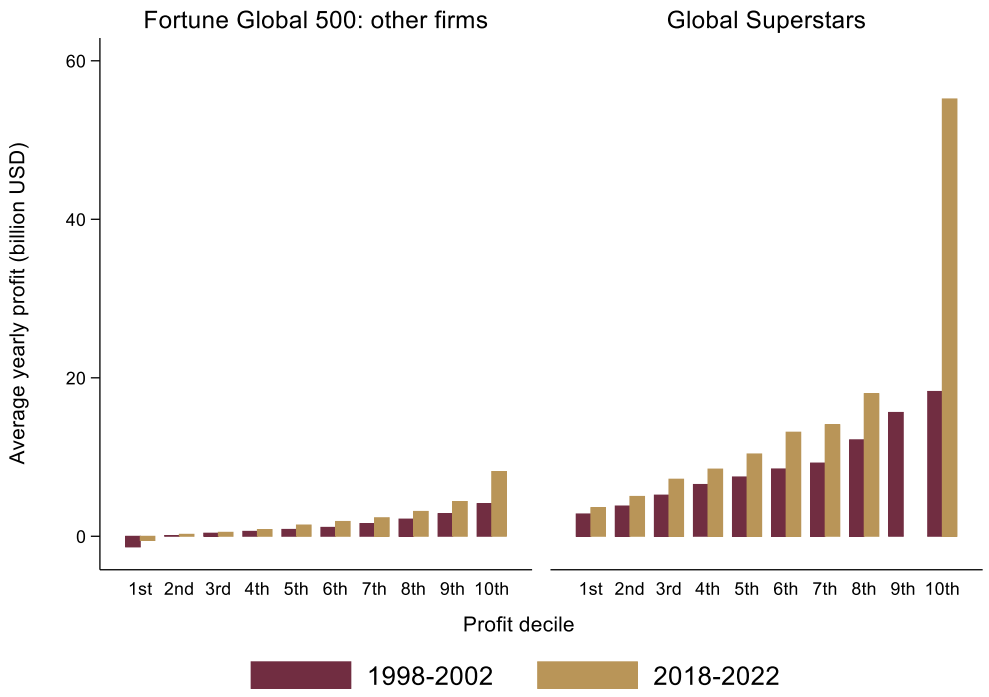
Figure 3.26: Evolution of profit and revenue of Global Superstars and other Fortune 500 companies in the consumer products sector



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.27 depicts the distribution of profit of Global Superstars and other Fortune 500 companies by decile in the consumer products sector. It shows that the profit increase is driven by the top-ten decile of the distribution.

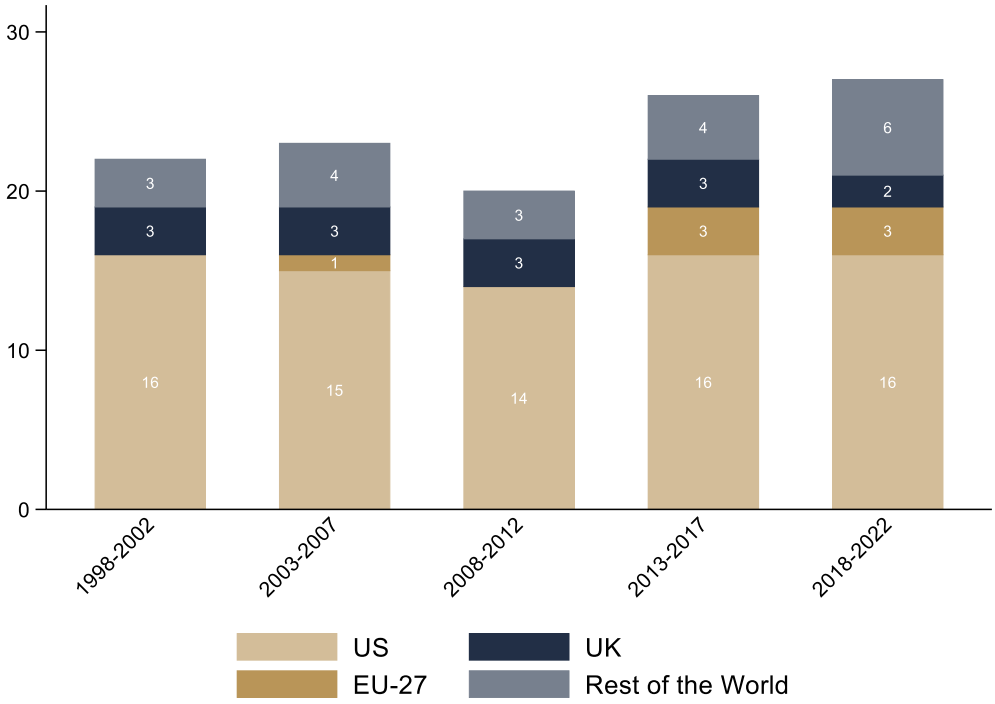
Figure 3.27: Distribution of profit of Global Superstars and other Fortune 500 companies by decile in the consumer products sector



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.28 depicts the geographical origin of Global Superstars in the sector of consumer products. In contrast to most other sectors, European firms (including the UK) are well represented amongst Global Superstars in the consumer products sector.

Figure 3.28: Geographical origin of Global Superstars in the sector of consumer products

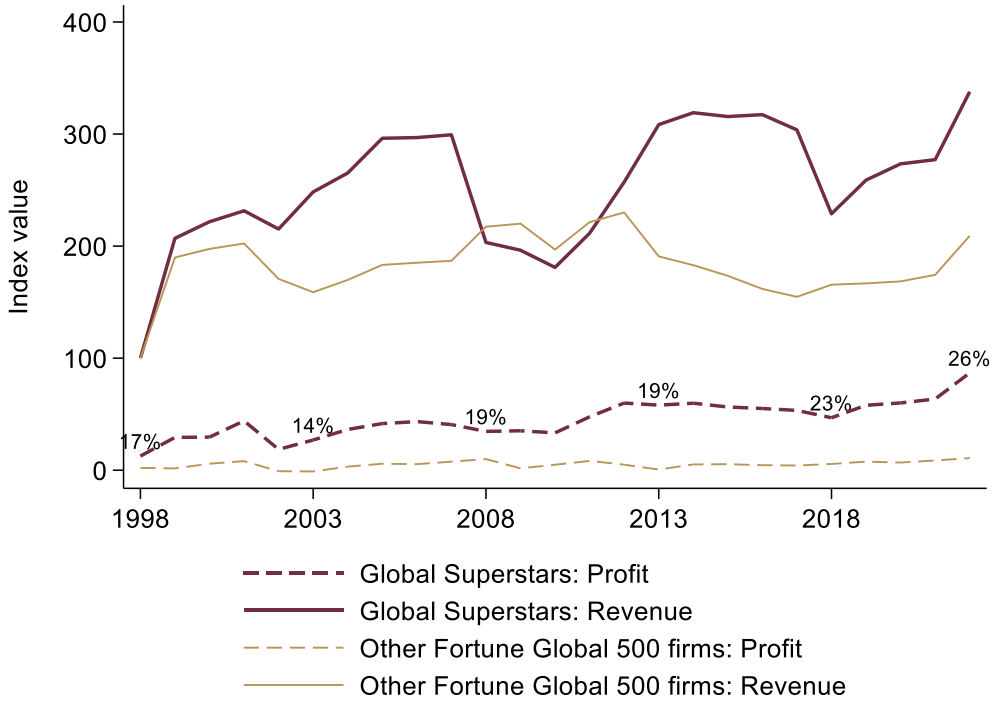


Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Global Superstars in the IT sectors

The IT sector covers the Electronics and Semiconductors sector, the Computer and Software sector, the Internet Services and the Information Technology Services sector. Figure 3.29 shows the development of the average profit and revenue of Global Superstars compared with the average profit and revenue of other Fortune Global 500 firms in the IT sector (normalised to 100 in 1998). Both revenues and profits of Global Superstars in the IT sector have increased sharply over the last two decades, and significantly more than the average revenues and profits of Fortune Global 500 firms.

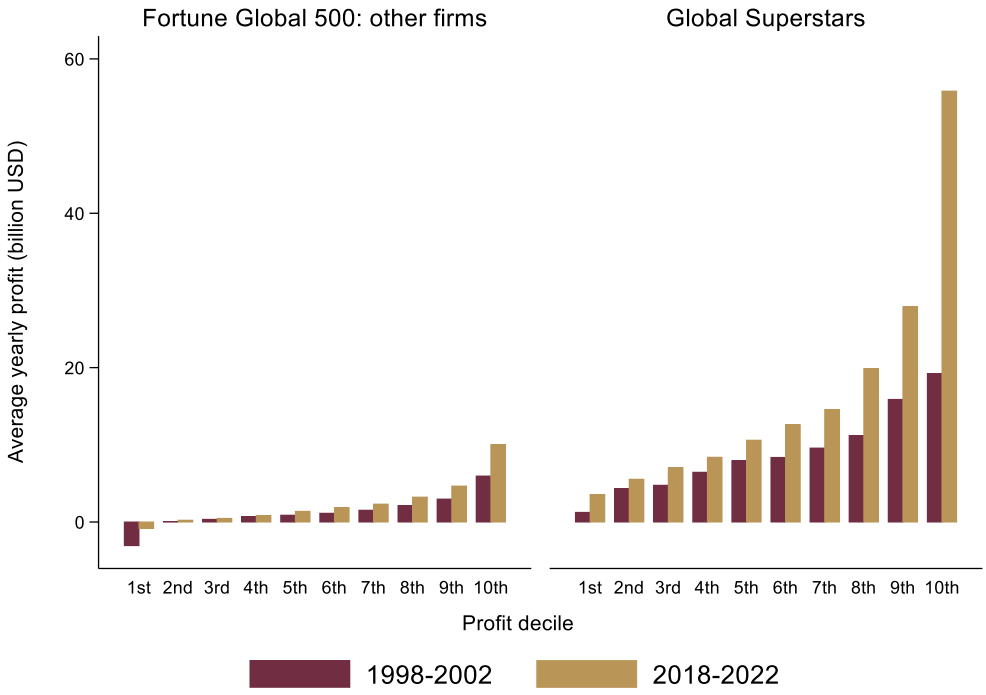
Figure 3.29: Evolution of profit and revenue of Global Superstars and other Fortune 500 companies in the IT sector



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.30 represents the distribution of profit of Global Superstars and other Fortune Global 500 companies by decile in the IT sector. It shows that the profit increase is driven by the top-ten decile of the distribution.

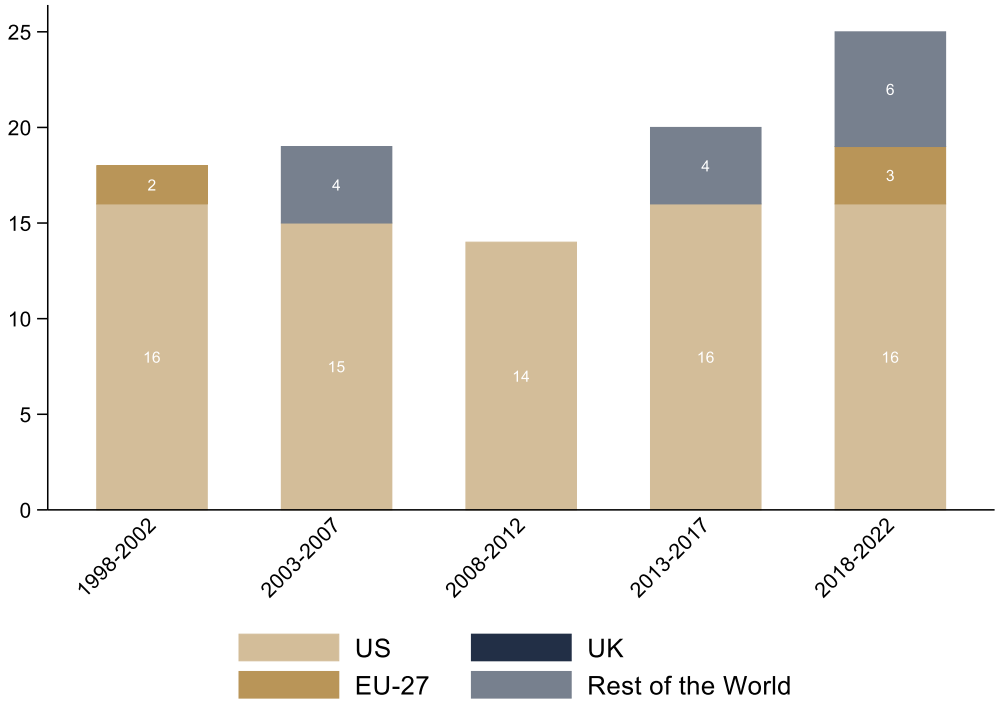
Figure 3.30: Distribution of profit of Global Superstars and other Fortune 500 companies by decile in the IT sector



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.31 depicts the geographical origin of Global Superstars in the IT sector. European firms have only become Global Superstars recently (period 2018-2022) in the IT sector.

Figure 3.31: Geographical origin of Global Superstars in the IT sector

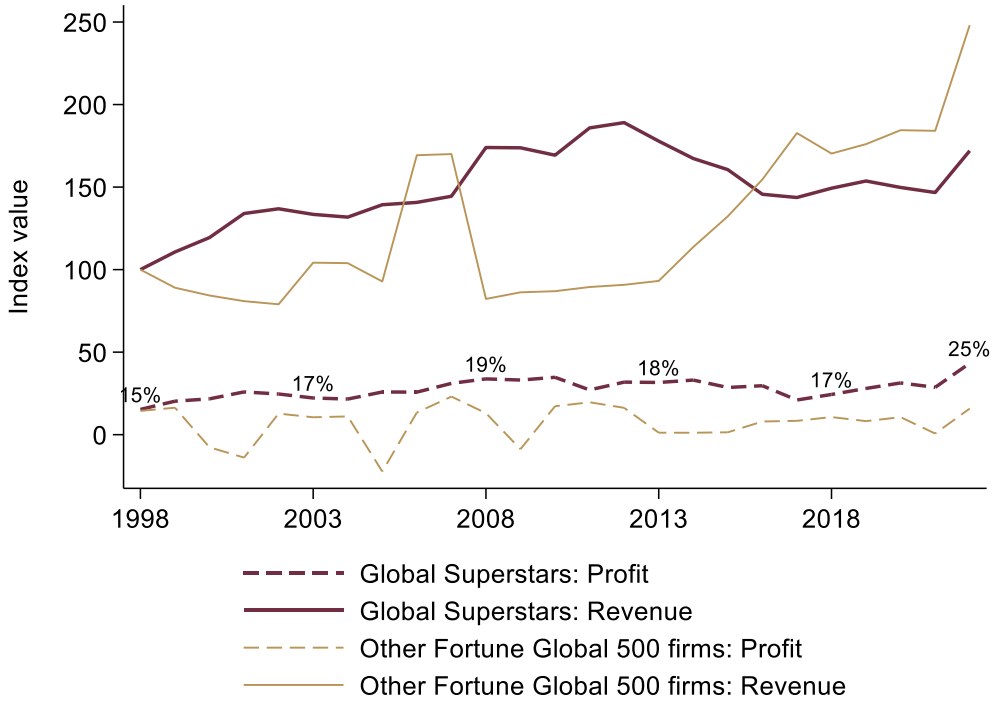


Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Global Superstars in the pharmaceutical sector

Figure 3.32 shows the development of the average profit and revenue of Global Superstars compared with the average profit and revenue of other Fortune Global 500 firms in the pharmaceutical sector (normalised to 100 in 1998). As in the consumer goods sector, average revenues of Global Superstars and average revenues of all Fortune Global 500 firms in the pharmaceutical sector have not evolved significantly differently, but average profits of Global Superstars in the sector have risen significantly more.

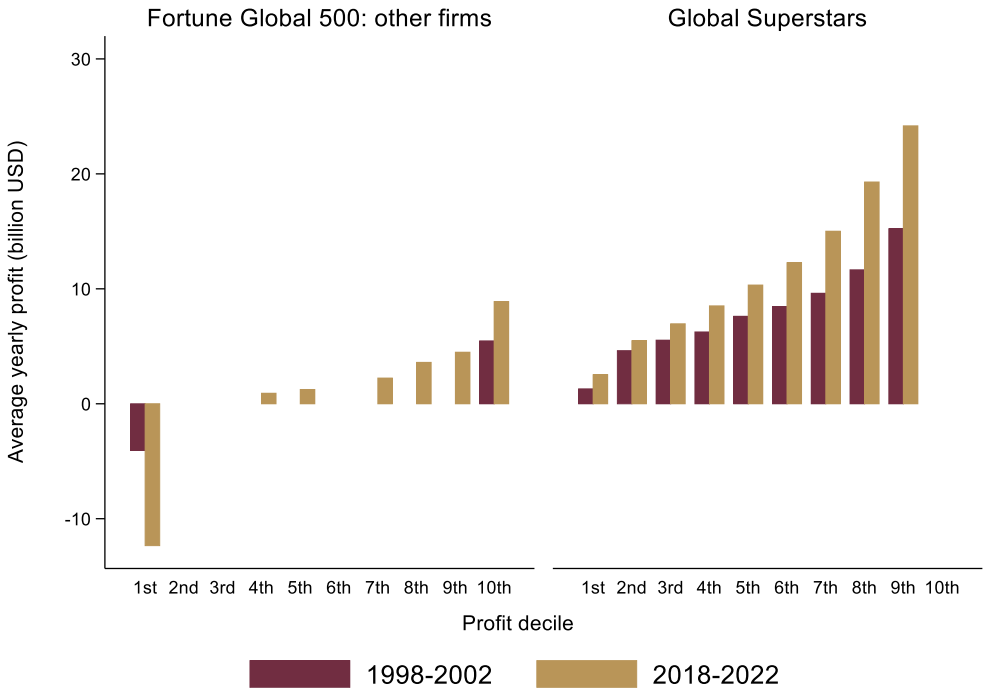
Figure 3.32: Evolution of profit and revenue of Global Superstars and other Fortune 500 companies in the pharmaceutical sector



Note: The sample of this graph is composed by 14 Global Superstars and 8 non-Global Superstars. For the period 1998-2015, only 1 non-Global Superstar firm is in the sample for each year. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.33 depicts the distribution of profit of Global Superstars and other Fortune Global 500 companies by decile in the pharmaceutical sector.

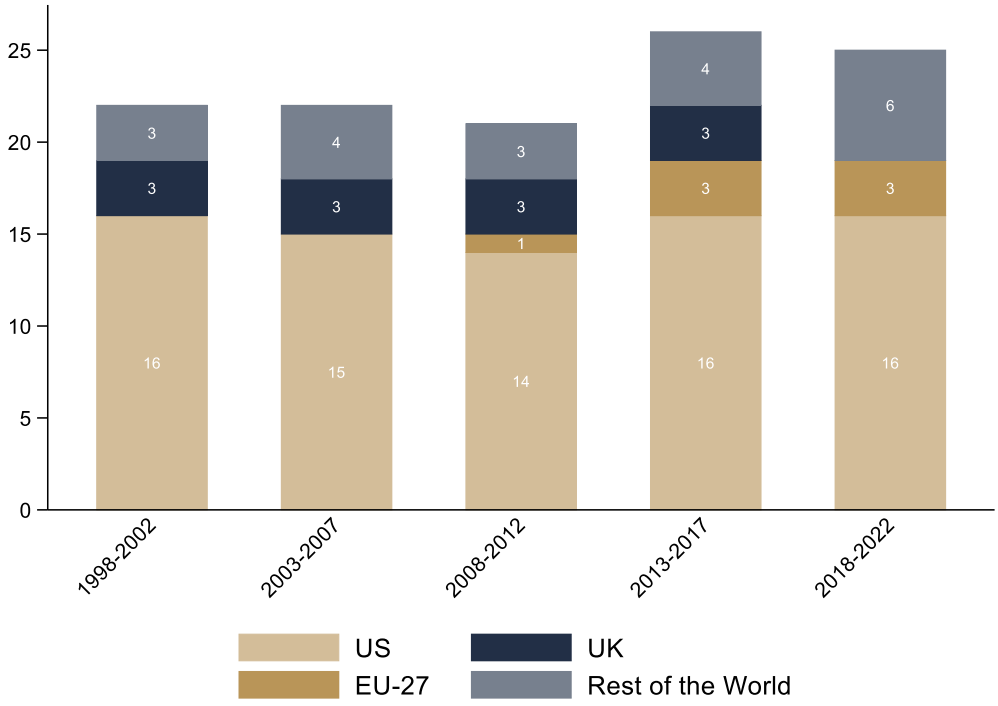
Figure 3.33: Distribution of profit of Global Superstars and other Fortune Global 500 companies by decile in the pharmaceutical sector



Note: The sample of this graph is composed by 14 Global Superstars and 8 non-Global Superstars. For the period 1998-2015, only 1 non-Global Superstar firm is in the sample for each year. Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure 3.34 depicts the geographical origin of Global Superstars in the pharmaceutical sector. European firms are well represented in the in the pharmaceutical sector.

Figure 3.34: Geographical origin of Global Superstars in the pharmaceutical sector



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

3.4.3.2 Barriers to entry in the consumer goods, IT and pharmaceutical sectors

We have documented above that the largest firms in the consumer goods, IT and pharmaceutical sectors have seen their turnover and profits rise, especially at the very end of the turnover and profit distribution. We have also shown that the most profitable firms in these sectors have been listed in the Fortune Global 500 database for decades—although it is less the case for the IT sector. We now turn to the question of whether rising turnover and profits are likely to be the consequence of barriers to entry and, if so, whether the barriers to entry are more likely to be of technical or strategic nature, or, in terms of policy, whether persistent high profits are caused by benign or malign factors.

This analysis deserves three comments. First, benign and malign causes are not mutually exclusive. A firm can enjoy direct and indirect network effects that protect its business and also engage in anticompetitive behaviours.

Second, while barriers to entry can only be identified at the geographic and product market level, activities of Global Superstars span across a wide range of product and geographic markets, making a market-by-market analysis impossible in this report. Furthermore, barriers to entry not only differ across regions, but they also evolve over time. For instance, as explained in section 3.4.2.3, institutional factors often play a key role for barriers to entry, especially when studying Global Superstars, which are significantly larger than average firms. Institutional factors may themselves vary over time (not always for the better) and across jurisdictions. Our analysis in this section (which is at the sector level) can therefore only be considered as illustrative.

Third, strong heterogeneity across sectors – and also within sectors – as regards the causes of rising turnover and profits makes it likely that in some markets the identified

malign factors will outweigh the benign factors, while for others the benign factors may be a bit stronger.

But, independently of whether the causes of the rise of a particular Global Superstar were benign or malign, the mere fact that there is not only a bigger gap between the top and the rest, but also less disruption, calls for an increased vigilance of policy makers and competition authorities. Indeed, if barriers to entry exist and if profits have increased over time, it is important that actions are taken to foster entry – especially if size matters. Disruption, or at least the possibility that disruption could happen is vital for markets, and very large firms are often protected not only by easier access to capital (and access to other resources, including human resources), but also by economies of scale or scope in the production of products and services, be it in the basic production process, or in the development of IT elements, or in the marketing of products and services.

Consumer goods

The sector of (fast-moving) consumer goods is a very diverse sector and market dynamics are likely to differ (sometimes significantly) across relevant product and geographic markets. In our data, the sector of consumer goods covers the Food and Beverage sector, the Tobacco sector and the Household, Personal and Cosmetic Products sector.

Most Global Superstars in these sectors sell branded products. The brands owned by Global Superstars, as well as their investment in brand recognition and marketing, play a key role in their ability to generate profits and maintain these profits over time. As depicted in Figure 3.16, Global Superstars hold significantly larger intangible assets than other firms.

Global Superstars in this sector include Philip Morris, which owns the eponymous tabaco brand, and also the brands Marlboro, L&M, and Chesterfield. Another Global Superstar is Coca-Cola, which does not only own the eponymous soda brand, but also Fanta, Sprite, Schweppes and Minute Maid. Similarly, Nestlé, another Global Superstar, does not only own the eponymous chocolate brand, but also Nespresso and water brands such as Perrier, Vittel and San Pellegrino. Procter and Gamble, yet another Global Superstar, owns shaving products Gillette, baby care products Pampers, feminine care products Always and Tampax, and home care products Mr. Propre, Ariel, Swiffer and Tide.

Successful brands are a powerful glue that attracts and retains customers. As explained in more detail in section 3.4.2.2, McAfee et al. (2004) classify brand loyalty as a primary barrier to entry. They argue that entry can be blocked by brand loyalty, because entrants face an unlevelled playing field, where customers are attached to their existing providers. According to McAfee et al. (2004), ancillary barriers to entry such as economies of scale reinforce this effect, because they make it even more difficult for competitors to profitably enter the market.

Döpper et al. (2023) study the evolution of markups for consumer products in the United States, using detailed data on prices and quantities for products in more than 100 product categories. They find that markups have increased by about 30% on average between 2006 and 2019. According to their analysis, this significant increase in markups is mainly attributable to cost decreases that are not passed through to consumers in the form of lower prices. These cost decreases could be the consequence of economies of scale or other cost-reducing factors, such as increased automation.

Döpper et al. (2023) also estimate that consumers have become less price sensitive overtime, which means that they require a larger price difference to switch to a less-preferred brand. Consumer price sensitivity can, in principle, reflect the strength of the producer's brand or the perceived value of lower prices. It is worth noting that, because

of the changing preferences, consumer surplus has increased over time despite the higher margins. But the changes in consumer surplus are not uniformly distributed: while consumers with incomes above the median had substantial gains in surplus, the lowest income quartile experienced substantial losses in some periods.

Brand (2021) estimates own-price elasticities of consumer products across thousands of retail stores in the United States. He shows that clients of supermarkets have become significantly less price sensitive between 2006 and 2017: according to the empirical investigation, the median estimated own-price elasticities have declined by 25% over this period. The author argues that these changes are likely to be the consequence of a wider offer of goods by stores which better match consumers' preferences. This broader supply of *niche* goods is a source of increased differentiation that generate significant increases in firms' markups.

At the top-end of the revenue and profit distribution, Global Superstars are likely to benefit from these various effects: brand loyalty, differentiation and economies of scale (and possibly economies of scope, due to their portfolio of brands).[283] Most Global Superstars have invested in their brands and other intangible assets for decades and have leapfrogged competitors by building a coherent portfolio of brands, which (in some cases) have become must-have brands for retailers. Consequently, entrants face an uphill battle when competing in consumer markets where Global Superstars are most powerful. The combination of brand loyalty and economies of scale constitute barriers to entry, that protect Global Superstars turnover and profits in some or most (relevant geographic and product) consumer markets.

IT sectors

In our database, the IT sectors cover the Electronics and Semiconductors sector, the Computer and Software sector, and the Internet Services and Information Technology Services sector. In these sectors, investment in intangible assets plays a key role, especially R&D expenditure. These investments in R&D can result in proprietary technologies, some of which are protected by intellectual property rights. These proprietary technologies protect incumbent owners of these technologies, especially when they are protected by intellectual property rights, because entrants find it more difficult to enter the market and compete against incumbents. Note that the link between market entry and intellectual property rights is subject to discussion. Arguably, when technologies protected by intellectual property rights are licensed and available to competitors, property rights can favour entry.

Furthermore, as discussed in detail in section 3.4.2.4, many IT sectors are characterized by (extreme) economies of scale and scope, as well as direct and indirect network effects. Indeed, as argued theoretically and confirmed empirically by Bessen (2020), IT has increased the advantage of large firms because they are able to use it more effectively. This argument is even more valid in IT sectors, where algorithms developed by firms can in many cases be replicated globally. This is especially the case for Global Superstars that can benefit from the comparative advantage of large firms in using IT developments on a worldwide basis.

Global Superstars in the IT sector can also be protected from entrants on their markets by direct and indirect network effects. Barriers to entry caused by direct network effects are often particularly powerful and difficult to circumvent, because competitors face an

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[283] This paragraph focuses on worldwide effects favouring Global Superstars (such as brand and scale), but other strategies such as exclusive and selective distribution agreements can also favour larger firms. Besides, competion agencies at EU level, but also at Member State level and in many other jurisdisctions routinely investigate abuses of dominant positions, cartels and other restrictive practices in the consumer goods sector.

unlevelled playing field as consumers are locked-in by network effects. Until they convince a sufficient proportion of the incumbent's customer base to switch to their products or services, network effects play against them. And, sometimes, only a fraction of customers is available to switch in a given period (because other customers continue using a good or service purchased previously). For instance, customers of Microsoft's word processor software use this specific software in part because they can exchange texts with their friends, clients and suppliers. Each of these customers individually benefits from network effects, because they can exchange documents with their contacts. So, unless a sufficient proportion of their contacts switches to an alternative word processor software supplied by a competitor of Microsoft (or unless the competitor provides a word processor software that is compatible enough), customers will not enjoy the same network externalities with this alternative, and are not likely to switch, unless the price difference is large enough. Furthermore, until customers change computers, they typically continue using the word processor software installed on their computer. Moreover, in this specific example, customers can be locked-in when they switch computers, because they want to continue using documents they have produced with their proprietary word processor software.

The effect described above can be even more powerful with indirect network effects. Indirect network effects are for instance observed on platforms that connect two categories of users, like users of payment services (shops and their customers). Entrants need to convince both categories of users of the platform to switch providers, some of which are likely to get an excellent deal from using the platform. Shops will not switch to an alternative provider of payment services, unless enough customers do so as well. Suppose, for instance, that customers are very well served by a platform of payment services, indirect network effects make it extremely difficult for competitors to convince shops to adopt their services. In this sense, indirect network effects can constitute very powerful barriers to entry, because users' willingness to switch not only depends on the price of the goods or services they purchase, but also on the quality of these goods or services, which depends, indirectly, on the choice made by other categories of users. This indirect effect locks in categories of users who, sometimes, would all have an incentive to switch to an alternative provider.

Other—more recent—concerns in the digital industry relate to so-called ecosystems (see e.g., Caffarra et al.,2023[284]). Accordingly, large digital companies do not think market by market, but have a broader vision of how to deploy funds, assets and capabilities across markets. These assets and capabilities include data, AI, content and user bases. When deployed well, these assets create virtuous cycles and growth. Caffarra et al. (2023) therefore argue against a market-based analysis of market power: "market power may need to be understood not just in terms of a product position in a given market, but as a function of controlling multiple 'levers' (assets) at the same time". Furthermore, they argue that controlling multiple relevant assets and capabilities "creates additional market power by insulating the buyer from current and future competition – for example, by creating greater asymmetries, hoarding relevant assets, and increasing barriers to entry and expansion."

At the top-end of the revenue and profit distribution, Global Superstars active in the IT sector are likely to benefit of some or most of these effects. While (in)direct network effects and ecosystems are likely to be related to the business model at hand, economies

[284] *Part 1 and Part 2 of the article accessible at: https://cepr.org/voxeu/columns/ecosystem-theories-harm-digital-mergers-new-insights-network-economics-part-1.*

https://cepr.org/voxeu/columns/ecosystem-theories-harm-digital-mergers-new-insights-network-economics-part-2.

of scale and scope, and the presence of proprietary technologies are likely to favour large companies across the IT sector. In conclusion, even if, as discussed in section 3.3.5, entrants have played a more active role in the IT sector in the past two decades than in other sectors (especially the consumer goods and pharmaceutical sector), it remains to be seen if entrants will be able to play the same important disruptive role looking forward, as in some cases entry in the IT sector requires the creation of a new ecosystem.[285]

Pharmaceutical sector

The pharmaceutical sector is characterised by large investments in intangible assets, especially R&D expenditure which are almost always protected by intellectual property rights (much more so than in the IT sector, where proprietary technologies are not always patented). The development of pharmaceutical products requires large-scale studies to prove not only that these products are safe for patients, but also that they cure the diseases that they were developed to cure. These large-scale studies require very significant funding, favouring incumbents over entrants.

Over the last decades, the pharmaceutical sector has evolved in two ways: first, most pharmaceutical firms have increasingly focused on specific product categories and, second, product development has increasingly been conducted by small (and often) new firms. Simultaneously, Global Superstars have focused on the (often worldwide) production and distribution of pharmaceutical products and acquired small innovative firms with promising pipelines of products (or reach long-term exclusive contracts with innovative firms). The pharmaceutical sector is also one in which competition agencies have been particularly active: sanctioned practices include excessive pricing, patent settlement agreements amounting to pay-for-delay, vertical agreements and killer acquisitions.

Akgit et al. (2021) argue that market power has increased significantly in the pharmaceutical industry. According to the authors, since 1995, markups have increased by almost 40% concentration has risen by almost 80% and profitability has doubled. In addition, they find that the rise of market power in the pharmaceutical industry is characterised by increased markups charged by incumbents, while the role of entrants is relatively minor. Our results on increasing profit and persistence are fully consistent with these findings.

Akgit et al. (2021) further argue that the market power of large firms in the pharmaceutical industry relates to the intellectual property rights system. More specifically the authors argue that "While the industry's business model requires relatively large operating profits as rewards to major innovations, there are concerns about some features of current intellectual property rights systems, such as excessive rewards to minor incremental innovations, so-called 'patent thickets', and 'killer acquisitions'." While it goes beyond the scope of this report to explore the advantages and disadvantages of the intellectual property rights systems, it seems relevant to underline that these systems create barriers to entry and favour incumbent firms over new entrants.

Furthermore, the main incumbents (which are often Global Superstars) increasingly focus on some specific categories of products (where they enjoy economies of scale and scope) and tie-up with innovative firms at early stages of their development. They thereby gain precious information on the effectiveness of pharmaceutical products under

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[285] *Competion agencies at EU level, but also at Member State level and in many other jurisdisctions routinely investigate abuses of dominant positions, cartels and other restrictive practices in the IT sector.*

development. Consequently, Global Superstars develop a coherent portfolio of drugs, owning a range of drugs in the same area of pathologies which they can produce, distribute and further develop. But (potential) competitors are maintained at a distance, and prices are set accordingly.

3.5 Summary and conclusion

This chapter of the report has defined Global Superstars as the most profitable of the world's largest firms and explored how these firms at the tail of the distribution of revenue and profit have evolved over the last decades. This work has started by reviewing the related literature on Superstar firms, which can be large on their respective markets, without being necessarily Global Superstars.

The literature on Superstar firms became prominent with Autor et al. (2017; 2020). Earlier studies like De Loecker et al (2020) had argued that the combined increase in concentration and margins could have been caused by lax antitrust enforcement (see for instance Council of Economic advisors (2016.)). Autor et al. (2017; 2020), in contrast, suggested that the combined increase in concentration and margins could be the outcome of a more competitive environment. They suggested that Superstar firms, defined as firms with superior quality, lower costs or greater innovation, would attract disproportionately more customers in a more competitive environment. Since Superstar firms have higher markups their gain in market shares across a range of sectors led to higher markups and concentration in a wide range of industries. In other words, the increase in markups is primarily due to a reallocation of sales and value added to (Superstar) firms with high markups, rather than to an increase in markups within firms. Autor et al. (2017; 2020) argue that underlying changes in economic conditions that have favoured Superstar firms could be wide-ranging phenomena such as globalisation or technological progress, which affect many economic sectors.

More closely related to our definition of Global Superstars, a 2018 discussion paper by McKinsey Global Institute, defines Superstar firms as firms that have a significantly greater share of global economic profit[286] than other firms. McKinsey's studies a group of 5,750 firms that together produce two thirds of global revenue and pre-tax profit are identified and the top 10% of these firms in terms of economic profit are classified as Superstar firms. The authors show that the gap between Superstar firms and the average firm has grown since the late 1990s, as has the gap between the firms in the lowest decile of economic profit and the average firm.

We have defined Global Superstars as the most profitable companies among the world's largest revenue companies. Building on methods previously proposed in the academic and business literature, we identified Global Superstars using the Fortune Global 500 dataset (thereby restricting to the world's 500 largest firms) combining the absolute value of profits and profit rate, in an aggregate index. Global Superstars were identified for five five-year periods starting in 1998.

Only 11 Global Superstars were present in all five-year periods studied (Coca-Cola, Intel, Johnson and Johnson, Merck, Microsoft, Nestle, Novartis, Pfizer, Philip Morris, Procter and Gamble and Roche. See Table C.4), and 13 Global Superstars were present in four of the five five-year periods studied. Interestingly, 7 of these 24 firms are pharmaceutical companies.

[286] *In this paper, Economic Profit = Invested capital*(Return on invested capital – weighted average cost of capital)*

Even among the global elite of firms, the ones at the very top stand out. We have shown that while the evolution of average revenue of Global Superstars and the average revenue of other Fortune Global 500 companies over the last 25 years does not follow a clear trend, the profit rate of Global Superstars has almost doubled, growing from 11% in 1998 to 20% in 2022, while there was only a small increase in profit rate for the average Fortune Global 500 firm. Profits of firms at the top of the distribution have increased significantly more than in the average global firm, resulting in a widening gap between profits of Global Superstars and other Fortune Global 500 firms. Our results also indicate that the profit of the firms with the highest profits has increased over time and the most profitable firms (10^{th} decile) became even more profitable both in absolute terms and relative to less profitable firms. Meanwhile, profits of Global Superstars have grown substantially since 1998. The growth is particularly pronounced for the top decile, i.e. the top 5 firms.

We have also explored the geographical origin of Global Superstars, showing that the U.S. hosts around half of the Global Superstars. China hosts an increasing number of Global Superstars, as the largest Chinese companies made it to the top of the list. The share of Global Superstars incorporated in the EU and UK has declined over the last 25 years.

Exploring the sectors of the Global Superstars, we found that they are active across a wide range of sectors. The distribution of Global Superstars across sectors has evolved considerably overtime: pharmaceutical firms and electronic firms have an increasing presence at the top of the distribution. In contrast, mining, oil and energy production has become less prevalent amongst Global Superstars.

We have studied persistence of Global Superstars at the top of the turnover and profit distribution. Overall, we found little turnover amongst Global Superstars. The most profitable of the largest world's firms appear to have remained surprisingly stable in the last 25 years, especially in the consumer goods and the pharmaceutical sectors. Some more movement was perceptible in the IT sector.

Finally, we have defined barriers to entry and explored whether barriers to entry protect Global Superstars from entrants. This analysis was more qualitative, because our analysis was undertaken globally in very broad sectors—namely consumer goods, IT and pharmaceuticals—while barriers to entry can only be identified for specific geographic and product markets.

In the consumer goods sector, we explained that Global Superstars are likely to benefit from brand loyalty, product differentiation and economies of scale (and possibly economies of scope, due to their portfolio of brands). Most Global Superstars invest heavily in their brands (and other intangible assets), which (in some cases) have become must-have brands for retailers. Consequently, the combination of brand loyalty and economies of scale constitute barriers to entry, that are likely to protect Global Superstars' turnover and profits from potential entrants.

In the IT sector, Global Superstars are likely to benefit from direct and indirect network effects, economies of scale and scope, and the presence of proprietary technologies. In some cases, these advantages can be strengthened by strategic behaviours such as the acquisition of potentially threatening new entrants. Even ifentrants have played a more active role in the IT sector in the past two decades than in the consumer goods and pharmaceutical sectors, it remains to be seen if entrants will be able to play the same important disruptive role looking forward.

In the pharmaceutical sector, Global Superstars are protected by patents. Some features of the patent and regulatory systems have attracted some criticism for providing too much protection for incremental innovations. While it goes beyond the scope of this report to explore the advantages and disadvantages of the intellectual

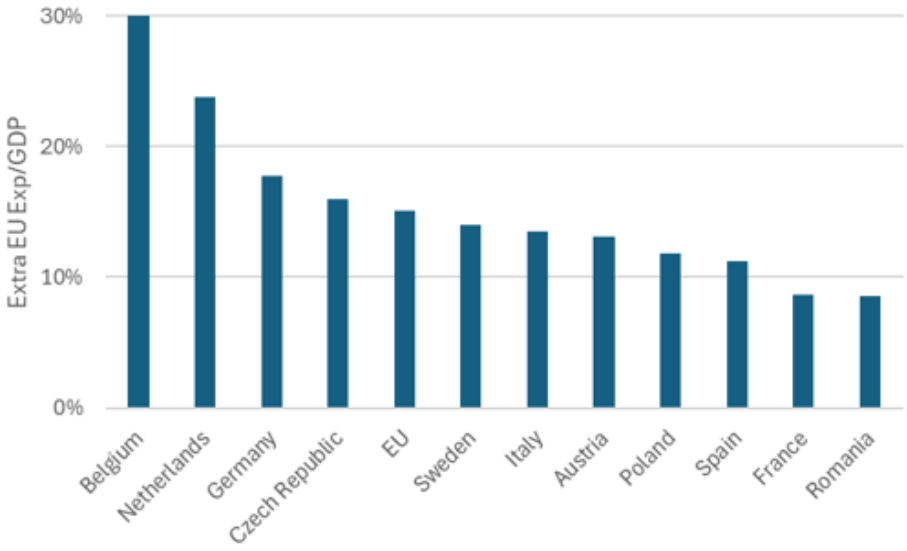
property rights systems, they contribute to barriers to entry and favour incumbent firms over entrants. The system can also be used strategically by incumbents in their favour.

Independently of the exact nature of the causes of the rise and persistence of Global Superstars, a more skewed and entrenched economy at the top of the profit distribution with high barriers to entry requires more vigilance from antitrust authorities.

4 Domestic competition and export performance

The objective of this workstream is to analyse the impact of domestic market competition (i.e. competition within markets in the EU) on the export performance of European firms outside the EU. This represents an important outlet for European economies and exports to countries outside of the EU are substantial. To provide an idea and comparable numbers across countries, we restrict our attention to the 11 economies that will be the focus of this chapter and compute the total export to countries outside the EU with respect to the GDP of these countries. Results, reported in Figure 4.1, show that for many countries exports to extra-EU markets over GDP are about 15%, with even larger numbers for countries such as Belgium (31%) and Netherlands (23%). Although this does not represent the impact of extra-EU trade on GDP (as that is represented by exports minus imports), exports outside the EU represent the positive component of the extra-EU trade to the country and play an important role for the balance of payment position of the country. Therefore, the competitiveness of European firms in those markets is important for the overall performance of the European economies and policy makers should carefully consider how policies and developments in domestic markets might impact the capacity of firms to export.

Figure 4.1: Extra-EU exports as a share of GDP, 2021



Source: Project Team based on Eurostat data

The approach followed in this chapter relies, first of all, on a review of the relevant economic literature. This is instrumental to developing an analytical framework and alternative hypotheses on how effective competition at home, or the absence thereof, may affect the ability and incentives of EU firms to compete successfully on the global stage. Indeed, an assessment of the available literature reveals that the relationship between competition in domestic markets and competitiveness on the global stage is to some extent ambiguous. The objective is therefore to identify all possible channels through which competition at home can affect export competitiveness. In particular, the literature identifies two main dimensions along which domestic competition can affect export performance: the impact of own-market (horizontal) competition and the impact of upstream competition in the input markets.

The hypotheses based on the economic literature are tested by administering a survey to 398 European firms[287] that operate in leading export sectors. More specifically, these are European companies that operate in the top export sectors of each country covered in the chapter or in the top export sectors for the EU-27 as a whole. The metric used to identify the top export sectors (for each country and for the EU-27) is a combination of the i) absolute value of exports outside the EU and ii) the share of worldwide exports. The main objective of the survey is to understand the competitive landscape in which these firms operate in the domestic market and their view on the way competition at home influences their export performance. The subsections below discuss the relevant economic literature (section 4.1); the methodology adopted to identify the export products and the exporting firms in these sectors (section 4.2); the list of the main export sectors for each of the 11 selected Member States and for the EU as a whole (section 4.3); the results of the survey (section 4.4); and conclusions (section 4.5).

4.1 Literature review

To identify how domestic competition affects the ability of EU exporters to compete in the international markets, this section provides an extensive review of the economic literature on this topic, focusing, in particular, on the mechanisms contributing to export success. Exports may be affected by competition in the domestic markets at two stages: in the firms' own market, and in the upstream markets where the firms purchase the relevant inputs. These channels are discussed in the following sub-sections. A comparison of the results of the present chapter with those of similar studies for the US and specific Asian countries is presented in Annex D.7.

4.1.1 Relationship between competition in exporters' own market and export success

The first key element to analyse is how the competitive landscape of the exporters' own domestic market affects their international competitiveness. The relationship between domestic market structure and export volumes has been extensively investigated in the economic literature, and most of it suggests that domestic competition pushes firms to invest in innovation and improve their efficiency. This, in turn, allows them to face international markets with a competitive advantage. Porter (1990) is amongst the strongest supporters of this view. He holds that a nation's competitiveness depends on the capacity of its industries to innovate and upgrade, and that companies benefit from effective competition in their domestic markets, as meeting this challenge forces them to innovate, which in turn gives them an advantage compared to international competitors. Box 4.1 provides more details on Porter's approach and key results. White (1974) provides a theoretical contribution which compares export volumes generated by a competitive market structure with those generated by a monopoly. He argues that exports are likely to be lower in a monopolistic market if price dumping is not allowed, since a monopolist prefers to serve only the domestic market, extracting more rent from consumers, rather than to sell its product on the international markets at lower prices.[288]

[287] *It was envisaged in the design of this study that a minimum of 350 firms would be surveyed.*

[288] *It is assumed that, in this case, the monopolistic firm faces a choice: it can either produce exclusively for the domestic market and forego exporting, or it can choose to export and also sell at home but forego the monopoly profits from the domestic market.*

Box 4.1: Porter (1990)'s approach and key results

In his book "The Competitive Advantage of Nations", Porter (1990) studied why nations succeed in particular industries and the implications for firm strategy and for national economies. To do so, he looked at 10 important trading nations: Denmark, Germany, Italy, Japan, Korea, Singapore, Sweden, Switzerland, the United Kingdom, and the United States.

Porter's methodology consisted in identifying, for all nations, all the industries (including products and services) in which the nation's firms were internationally successful in 1985. International success was measured by the presence of significant exports or foreign direct investment drawing on strengths or skills created in the home country. Then, for each nation, Porter explained the pattern of successful industries, the connections among them and how the pattern had changed over time by using so-called cluster charts (i.e. figures mapping industries and grouping them firstly based on end-use application;[289] then, within broad end-use categories, the charts highlight the vertical connections among industries[290]).

The primary data source for preparing the charts was the United Nations International Trade Statistic Yearbook. All three-, four-, and five-digit SITC industries were identified in which the nation's share of the world exports in the industry equaled or exceeded the nation's average share of world trade in the year. Porter included relevant industries at the lowest level of aggregation for which data were published (e.g. to eliminate double counting, the four-digit industry was excluded where there were five-digit industries available).

The list of industries emerging from the UN trade data was supplemented in two main ways. First, industries were added where available data indicated that the nation's firms had made substantial foreign direct investments, if the investments were based on skills and strengths developed in the nation. Secondly, service industries were added, using national data on invisible trade, other published sources, and interviews.

Three of the countries analysed by Porter – Germany, Italy, and Sweden – are also included in our study. Porter's key findings for these countries are therefore summarized in the corresponding sections of this chapter.

Source: Porter (1990)

The negative relationship between domestic market concentration and export levels is confirmed by several empirical analyses. Clougherty & Zhang (2009) distinguish three different channels through which domestic competition affects export performance. By conducting empirical tests on the airline service sector, the authors observe that a reduction in the number of domestic competitors in the Canadian market led to a decrease in an airline's market share on international routes. In addition, they find that domestic rivalry improves the export performance of firms. Donghwan & Marion (1997) focus on the number-of-competitors effect and show that the net export share[291] is negatively related to industry concentration in several US food manufacturing industries. By also looking at the number-of-competitors effect, Hollis (2003) shows that manufacturing industries in developed countries tend to export less whenever their own

[289] *i.e. upstream industries, industrial and supporting functions, and final consumption goods and services.*

[290] *i.e. primary goods, machinery for production of the primary goods, specialty inputs, associated services.*

[291] *Measured as exports minus imports as a percentage of total world exports in the industry.*

domestic market concentration is higher than the concentration at the international level (Donghwan & Marion, 1997).

A second mechanism, going in the opposite direction, suggests that more competition in the domestic market may be detrimental to exports, since it prevents firms from reaching the scale that would enable them to compete in international markets. The authors highlighting this mechanism advocate – implicitly or explicitly – for governments' intervention to incentivise the creation of "national export champions", suggesting that higher concentration in the domestic market may contribute to international competitiveness (Chou, 1986; Pagoulatos & Sorensen, 1975; Pagoulatos & Sorenson, 1976). More specifically, "infant-industry models"[292] advocate government support to sectors with potential economy-wide knowledge externalities (i.e., with a potential to increase the general level of knowledge within an economy) but with high initial production costs which decrease only progressively over time as a result of learning-by-doing. The idea is that these sectors need to be protected against (foreign) competition in the short run until they become fully competitive. Nunn & Trefler (2010) analyse whether, as suggested by proponents of the "infant industry" arguments, the growth of productivity in a country is positively affected by tariff protection biased in favour of activities and sectors that are "skill-intensive", that is to say, use skilled workers more intensely. Their analysis suggests that (skill-intensive targeted) tariff protection may lead to long-term specialization in skill-intensive industries, and actually enhance growth, not only in the sector that is being subsidized, but in other sectors as well (as the differential expansion of skill-intensive industries is beneficial for long-term growth). Krugman (1984) illustrates how import protection increases domestic and export market shares. Import protection policies – such as tariffs and import quotas – discourage international competitors from entering the domestic market, thereby reducing domestic competition overall. Domestic producers then have fewer competitors, allowing them to expand their scale and have lower marginal costs, whereas foreign firms remain in the higher part of their marginal cost curves, causing their market share to fall.

The link between competition and scale is at the heart of the policy debate on European champions,[293] which gained increasing relevance in the past two decades.[294] For example, after the EC blocked the merger of two rolling stock manufacturers in 2019, Alstom and Siemens, (which, according to supporters of the national champions theory, had it been cleared, would have created a European champion in the rolling stock sector, a company able to compete with other leading companies in this sector, such as China's CRRC), the French and German governments published a manifesto for a "European industrial policy fit for the 21st century". Amongst other arguments, the manifesto holds

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[292] Aghion, et al. (2015) summarise the infant-industry argument as follows. Consider a local economy that includes both a traditional sector (especially agriculture) and an industry in its infancy. Production costs in industry are initially high, but "learning by doing" decrease these costs over time, even faster as the volume of activity in this area is high. In addition, increased productivity which is a consequence of this learning by doing phase has positive spillovers on the rest of the economy, i.e., it increases the potential rate of growth also in the traditional sector. In this case, a total and instantaneous liberalization of international trade can be detrimental to the growth of the local economy, as it might inhibit the activity of the local industry whose production costs are initially high: what will happen in this case is that the local demand for industrial products will turn to foreign importers. It means that learning by doing in the local industry will be slowed itself, which will reduce the externalities of growth from this sector towards the traditional sector.

[293] Strange (1996) refers to champions as "firms given favourable treatment by the state to help them maintain a dominant presence in the home market and a competitive share in the world market".

[294] The interest in a more proactive industrial policy in the EU emerged at the turn of the millennium when, after the completion of the single market and the introduction of the euro, the EU formulated a strategy for its competitiveness.

that a regulatory level playing field is currently lacking at the global level, and advocates for changing the European regulatory framework (e.g., relaxing EU merger control) so that European companies can better compete on the global stage (Altmaier & Le Maire, 2019). With the aim to counter the state-dominated Chinese economy, a recent study by the Federation of German Industries BDI (2019) on China also advocates for looser merger control in the EU. This was made even more explicit by the report "National Industry strategy 2030", released by the German Federal Ministry of Economic Affairs and Energy, which calls for a rewriting of merger control and additional industrial policy measures aimed at making some large European companies even larger and more profitable (BMWK, 2019).

The creation of European champions and the "infant industry argument" have been challenged both from a theoretical and from an empirical standpoint. Motta & Peitz (2019) criticised the proposal from the German and French governments to relax EU merger control, as, they argue, it may lead to the approval of clearly anti-competitive mergers with negative effects for EU consumers. They argue that there is nothing in the European merger control regulation that prevents the creation of European champions, provided that the merger brings about sufficiently strong synergies.[295] Petropoulos & Wolf (2019) suggest alternative avenues to protect European firms and consumers. Firstly, the authors encourage considering new regulation that could be applied to foreign firms that benefit from state support in a way that creates an unfair competitive advantage that European companies cannot match.[296] The recent Foreign Subsidies Regulation goes in the direction aimed by the authors, by tackling subsidies granted by non-EU governments to firms operating in the Single Market, which previously went unchecked, and thus allowing for a level playing field for all companies operating in the Single Market. Secondly, the authors advocate for Europe to go beyond defensive measures and more actively pursue a strategy that bolsters investment and innovation in Europe, while creating the conditions for firms to scale up in a well-integrated single market.

From an empirical angle, Krueger & Tuncer (1982) analysed the effects of industrial policy in Turkey in the 1960s and showed that firms or industries not protected by tariff measures were characterized by higher productivity in growth rates than industries that were protected – and hence shielded, to some extent, from competition in the domestic market. Theoretically, the main arguments against industrial policies aimed at promoting new infant industries have historically been that industrial policy allows governments to pick winners in a discretionary fashion and prevents competition from exerting one of its key, and most beneficial, functions.[297] This also increases the scope for capture of governments by vested interests. Aghion et al. (2015) contribute to this debate by showing that there can be complementarity between competition policy and

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[295] The authors instead propose a revision of EU merger guidelines that reverses the burden of proof: while it currently falls on the antitrust authority to prove that a merger is anti-competitive, according to the authors it should be the merging parties demonstrating that the merger is pro-competitive (e.g. will generate sufficient efficiencies). See Motta & Peitz (2019).

[296] The recent Foreign Subsidies Regulation goes in the direction aimed by the authors, by tackling subsidies granted by non-EU governments to firms operating in the Single Market, which previously went unchecked, and thus allowing for a level playing field for all companies operating in the Single Market.

[297] As discussed in chapter 1, competition is a process of rivalry that rewards the best performing firms (selection effect).

suitably designed industrial policies in inducing innovation and productivity growth.[298] In addition, a report by ISPI (2019) pointed out that i) from 1990 to date, out of the 7,311 notified concentrations only 29 were blocked by the Commission (442 were approved subject to remedies), and ii) in recent years, large firms have grown in their respective sectors both in the United States and in the EU, with a more marked trend in the US (see chapter 3). According to the author, this evidence supports the view that competition policy is not necessarily an obstacle to the establishment of European champions.

However, it may be misleading to assume that successful exporters need to coincide with European champions, i.e. large enterprises. The size of EU's successful exporters may be heterogeneous, and these firms do not necessarily coincide with large multinational corporations. Simon (2009) coined the term "hidden champions" to identify small- and mid-sized companies that are world leaders in their markets, with high level of exports. More details on the concept of hidden champions and their key features are provided in Box 4.2.

Box 4.2: Simon (2009)'s concept of "hidden champions"

In his book "Hidden champions of the twenty-first century: Success strategies of unknown world market leaders", Simon (2009) argues that the export strength of a country is not determined by a few prominent and well-known corporations, but rather by a multitude of medium-sized enterprises that are very strong exporters (the "hidden champions"). According to the author, to be qualified as a hidden champion, a company must meet three criteria, and namely:

- be the number one, two or three in the global market, or number one on its continent, based on market shares;
- have revenues below $4 billion;
- have a low level of public awareness (as opposed to large corporations which are typically well known to the public).

Simon (2009) describes that hidden champions are spread around the world, but with higher concentrations in Germany and Scandinavian countries. They tend to have a limited number of competitors, as 60% of them have less than 10 competitors worldwide but claim to face fierce competition in their domestic market. Their most significant competitor is usually a foreign company. More specifically, the locations of the most important competitors are mostly Europe and the US. In addition, hidden champions are very different from one another and operate in heterogeneous competitive environments. The market share of the market leader depends significantly on the number of competitors. On average, if the number of competitors increases by 1%, the market share of the market leader decreases by 0.34%.

The competitive profile of the hidden champions is complex and characterized by the presence of multiple strategic competitive advantages.

Notably, product quality stands out as a prominent factor contributing to their competitive edge. Furthermore, at the time Simon (2009) wrote, the hidden champions had made notable advancements in their competitive position across a

[298] The authors argue that without industrial policy, innovative firms may choose to operate in different sectors in order to face lower competition on the product market, leading to high sectoral concentration and low incentives to innovate because of a "monopoly replacement effect". In such a case, industrial policies that encourage firms to be active in the same sector, such as through tax holidays or other tax-subsidy schemes, will decrease concentration in the targeted sector and enhance incentives for firms to innovate.

broad range of performance parameters. In particular, the competitive performance of on-time delivery had significantly improved, transitioning from a neutral position to a distinct strategic advantage (due to the extensive efforts undertaken by numerous hidden champions in logistics and supply chain management in the few years leading to 2009). The other most notable transformations compared to previous years were in the realms of advice and systems integration. Being based on internal competencies, these competitive advantages are challenging to imitate, thereby creating significant barriers to entry for potential competitors.

Lastly, and notably, price is a significant competitive disadvantage for the hidden champions. Nonetheless, the relatively weaker competitive position in terms of pricing is, in essence, acceptable, because it is offset by several competitive advantages related to performance.

Source: Simon (2009)

4.1.2 Relationship between competition in exporters' upstream markets and export success

The degree of competition in upstream markets may also represent a relevant channel in the determination of export levels. The empirical literature finds that pro-competitive regulation of input product and services markets, such as energy and communications, contributes to export competitiveness of downstream sectors. According to Barone & Cingano (2011), the annual export growth in OECD countries between 1996 and 2002 would have been 1% higher if upstream services had been less anti-competitively regulated.[299] Upstream service regulations have been shown to increase input prices for downstream firms in EU economies (Martin, Roma, & Vansteenkiste, 2005). Hence, firms might be penalised when facing international competitors which operate in countries with less anticompetitive regulations in upstream services. Allegra et al. (2004) show that Italian firms that depend on intermediate industries with a high number of interventions made by antitrust authorities (which proxy for the aptitude of the sector to anti-competitive behaviour) tend to have lower levels of export and lower export growth. Ricci & Trionfetti (2011) show that there is a positive relation between a firm's comparative advantage (i.e., benefitting from lower costs of the labor and capital inputs compared to other sectors/countries) and its export performance.[300]

4.1.3 Reverse relationship between domestic competition and export success

It is worthwhile to note that the relationship between home competition and export competitiveness may run in both directions. Competition may favour EU exports, but EU exporting firms can produce positive externalities in the domestic market, bolstering efficiency and competitiveness, as exporters can often access diverse knowledge inputs not available in the domestic market. There is increasing empirical evidence that confirms the existence and relevance of this "learning by exporting" mechanism (De Loecker, Detecting learning by exporting, 2013; Salomon & Shaver, 2005) albeit others,

[299] *i.e. the study focuses on the effects of anti-competitive service regulation.*

[300] *For completeness, it should be noted that competition in downstream domestic markets (i.e. where firms' direct customers operate and sell their products) is another possible determinant of export levels, but this channel is not examined in the present study. Downstream competition generates higher output levels downstream, which translates into higher input demand for intermediate firms; in turn, these may reach a greater scale and become more efficient, improving export performance. Higher levels of concentration in downstream markets may also lead intermediate firms to lower their investments in innovation, harming their ability to compete in international markets.*

such as Clerides et al. (1998) argue that the positive association between exporting and efficiency is explained only by the self-selection of more efficient firms into the export market. Martins & Yang (2009) provide a meta-analysis on more than 30 papers and conclude that exporting positively affects efficiency, and efficiency improvements are larger during the first year in which companies start exporting. Atkin et al. (2017) conduct a randomized experiment that generates exogenous variation in the access to foreign markets and find that treated firms report 16–26% higher profits, exhibit large improvements in quality alongside reductions in output per hour relative to control firms and benefit from knowledge transfers.

The effects of this learning-by-exporting feature on domestic markets may be twofold. In principle, the exporting firm may lower marginal costs and become more efficient, as suggested by most of the empirical studies mentioned by Martins & Yang (2009), while domestic competitors without access to international markets struggle to keep up with it. This could lead to a rise of domestic market power, as exporting firms increase their market share while less efficient ones are marginalized. As will be further explained in section 3.1.2, one of the advocates of this mechanism is Melitz (2003). However, if we consider the presence of spillover effects in the domestic market, non-exporting firms might benefit from the presence of a competitor that operates in international markets, making it easier for other firms to break into foreign markets. This could be generated, for example, by human capital flows among firms in the same geographical area, or because competitors understand that there is a competitive advantage in exporting and shift their focus on international markets in order to improve efficiency and maintain their domestic market share. Even if they do not find evidence of the learning-by-exporting mechanism, Clerides et al. (1998) find evidence of these spillover effects at the regional level in developing countries such as Colombia and Morocco.

4.2 Methodology to identify the relevant sectors and companies

To identify the top export products and the relevant exporting firms, the Project Team adopted a multi-steps procedure, summarised in Figure 4.2 below. First, we selected the Member States to focus on. In particular, European firms in leading export sectors were identified for 11 Member States: the five largest EU economies by GDP (i.e., Germany, France, Italy, Spain and The Netherlands), five more countries identified as those with the highest extra-EU export value[301] (Belgium, Austria, Poland, Czech Republic, and Romania), and Sweden.

Secondly, we identified the top 20 export products in each of the selected Member States and the top 40 for the EU-27 as a whole. These were obtained based on a combination of two measures, the value of extra EU exports of a country and the share of the country in the worldwide trade of the product. In particular, we calculated the average rank between: i) the ranking of products based on the first metric and ii) the ranking of products based on the second one. This step is described in more detail in section 4.2.1 below.

Finally, firms operating in the leading export sectors were identified following another multi-stage approach, which relied on information from sector and trade associations and from ITC Trade Map, a database of exporting firms. This step is described in section 4.2.2 below.

[301] *The data source is Eurostat: https://ec.europa.eu/eurostat/cache/metadata/en/ext_tec_sims.htm. The countries already included in the study due to the size of their GDP are not included in the ranking to select the countries with higher exports to make sure that we add new countries to the list of selected countries.*

Figure 4.2: multi-steps procedure to select the relevant sectors and companies

Source: Project Team

4.2.1 Identification of the top export products

The Project Team identified the top 20 exported products for each of the 11 countries under analysis as well as the top 40 export products for the EU-27 as a whole. To do so, the Project Team relied on detailed export data from ITC Trade Map, a company providing "small businesses, policymakers and business support organizations in developing countries an array of trade-related practical training, advisory services, and a wealth of business intelligence data".[302] The ITC Trade Map database adopts the Harmonized System (HS), a standard and detailed categorization of products, encompassing more than 6,000 product categories, which is commonly used by customs agencies worldwide. The Project Team exploited HS data at the maximum level of granularity available (6 digits), to be able to focus on narrow definition of products and to offer a precise indication of the products for which each country shows a competitive advantage. For the ranking, the Project Team used data for 2021, the latest year for which the dataset reported non-preliminary data. This was also the year in which trade recovered after the decline suffered at the beginning of the Covid pandemic in 2020. While constructing the ranking, the Project Team considered the whole EU-27 as a single domestic country. Consequently, the Project Team only considered exports towards countries outside the EU-27.

The Project Team obtained the ranking of export products by implementing a two-step procedure which aimed to account for both the amount of extra EU-27 exports of a

[302] *The ITC Trade Map reports trade flows by country and year by drawing information from UN Comtrade as well as from national government sources. In addition, ITC Trade Map also reports data on firms exporting specific products by drawing information from Kompass and Dun and Bradstreet. Information on exports at the firm level is self-reported by firms and it is complemented by web searches and surveys of the companies providing the data. See https://www.trademap.org/Index.aspx.*

country and the relative strength of the country in the specific product market. Indeed, a ranking based on either of the two measures alone would be sub-optimal. On the one hand, a ranking fully based on the value of trade would have given more weight and higher relevance to widely traded products (i.e. products with larger markets) and it would have failed to identify products for which the country shows to be particularly competitive. On the other hand, a ranking fully based on the share of worldwide exports could give more weight to products which might not be very relevant for the economy of a country. If the market of a product is very small, it is easier for a single country to represent a high share of that market even with a small amount of exports, and this would give a more prominent role to products for which the country shows a strong position in the market but which might not be very important for its economy. The mixed approach aims at obtaining a balance between these two issues. The Project Team focused on the top 50 products in terms of export value and then obtained the average rank between i) the ranking of products according to the amount of extra EU-27 export and ii) the ranking according to the share of the country in the worldwide trade of the product. The resulting average was then used to define the final ranking, with products with the lowest average rank being ranked higher.

After computing the new ranking, the Project Team focused only on the top 20 products for each country. It should be noted that HS6 is a very granular classification and, consequently, if a country plays an important role in a specific sector, it is possible that multiple products from that sector will be present in the top 20 exported products for the country. In the analysis, we consider each of these products and identify exporting firms for each of them. Only for the sake of presentation and to provide a more intuitive picture, in section 4.3 we report sectors based on a higher level of aggregation. The full ranking of the top 20 exported products for each country based on the more granular HS6 classification is reported in Annex D.1. In those tables we also show the value of extra-EU exports and the share of the country's exports of the product in the relevant worldwide export market.

The Project Team followed a similar procedure to identify the top 40 products exported outside the EU-27 by the EU-27 as a whole. First, the Project Team obtained the total value of non-EU exports by summing up non-EU export for all the countries belonging to the EU and then followed the same procedure outlined above to rank products. The list of the top 40 exported products by the EU-27 at HS6 level is reported in Annex D.1. Note that, in this case, the ranking in individual countries encompasses the top 50 products for each country if the product is not found among the top 20 for any of the 11 countries under study. All but one of the top 40 EU-27 export products are matched with products in the top 50 products of the 11 countries. More specifically, 28 products at the EU-27 level are present in the top 20 of at least one country under analysis, while 11 are not in the top 20 but are present in the top 50 list. Finally, one product ("Odoriferous substances and mixtures") is not present in the top 50 ranking in any of the countries under analysis.

4.2.2 Identification of the exporting firms

The Project Team then moved to the identification of the firms operating in leading export sectors. In particular, based on the Project Team's previous experience conducting surveys, it was estimated that about 14,000 firms needed to be identified and contacted to be able to obtain interviews with at least 350 firms (target number agreed with DG Comp), assuming an effective response rate of 2.5%, common in business surveys conducted via telephone. The Project Team followed a multi-step approach to identify the suitable number of firms for the analysis.

A first set of firms was directly obtained from sector and trade associations, which were specifically asked for the contacts of firms active in the export of the products identified above. The Project Team contacted associations by email, phone and, when requested,

through Teams calls to provide the necessary details for the correct identification of leading exporting firms. Ultimately, it was possible to collect contacts for about 120 firms across the 11 countries.[303]

Secondly, the Project Team relied on the list of members from the sector and trade associations, often freely available from their website, and list of exporters for specific products by country, reported on the ITC Trade Map website. This second step balanced the need to identify firms which were active in specific sectors and could possibly be contacted with the support of firms' associations, and the necessity to identify firms actually exporting the products of interest. The Project Team was able to obtain names of members for about 130 firms' associations for a total of about 10,900 firms. These companies were then matched by name with the list of companies active in the export market for the products identified above. This list included export information for about 68,000 firms. The matching between these two sources provided a list of 1,390 firms.[304]

The final step fully relies on the list of exporters by country and product reported on the ITC Trade Map website (see section 4.2.1 for a description of the database). As mentioned above, data for exporters are obtained from Kompass and Dun and Bradstreet and are voluntarily provided by firms registered with these companies and complemented by data obtained through web scraping and surveys. The Project Team randomly extracted firms from the list of exporters to meet the target of 14,000 sampled firms. This list has the important advantage that it contains exporters of the products under analysis, and it ensures that the Project Team would be able to identify exporters for each of the product-country pair under analysis. Since it was not possible to know where the firms export, the Project Team included a screening question in the survey to identify firms exporting outside the EU-27. The Project Team reports below the procedure followed for the extraction of the random sample.

First, the Project Team set a target number of contacts by country. The distribution of target contacts is uniform across countries, and it gives more weight to larger economies. After setting this aggregate target by country, the total number of contacts was equally divided across products in the list of the top exported products by country. Then, the Project Team extracted firms from the overall list of ITC Trade Map (the list at this point does not include firms that were already matched in step one or step two), and randomly extracted firms to meet the target for the specific product. If the number of firms per product was not sufficient to meet the target, then the missing firms were divided across the other products recursively, until the overall target for the country was met.

The Project Team then progressively expanded the random sample up to a total of 21,534 firms. This was done because not all the identified firms had a valid phone number or e-mail address, could be reached, or qualified for the survey. In particular,

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[303] We would like to thank the following associations for their cooperation: Assolatte, ANFIA, Association of the Austrian Wood Industries (Holzindustrie), Confindustria Ceramica, Confindustria Varese, Centro Studi Confindustria, Federvini, FIAA - Food Industries Association of Austria, Forum Mineralwasser, Gican, ONT Italia, Sdružení pro hračku a hru z.s., Swedish Mining Industry, Swedish Wood.

[304] The Project Team used company names to match firms across the two datasets since administrative companies' IDs were not available. The matching relied on a procedure of fuzzy matching performed using the program STATA (reclink) after standardizing company names. The fuzzy matching procedure performs a probabilistic match between firms in the two datasets and computes a similarity score for the paired names. This score depends on the similarity of the firm names across the two datasets, where a score equal to one identifies a perfect match. After manual inspection of the matches, the Project Team considers reliable matches those with a similarity score of 0.98 or higher.

out of these 21,534 firms, the Project Team was able to identify a phone number for 18,530 firms and a contact e-mail address for 10,266 companies.

In addition, to identify firms in the top 40 export sectors for the EU-27, the Project Team restricted its attention to firms in the 11 economies under study. Most products (28 out of 40) were already present in the list of the top 20 products by country. Since they were already covered, no additional firm was added for these products. An additional 11 products were instead present among the top 50 products in terms of export value in at least one of the 11 countries. To cover also these products, the Project Team included in the list of companies to be sampled also companies exporting these products from the country where the product is ranked highest according to the methodology used in section 4.2.1. Only one of the top 40 EU-27 export products was not covered by the top 20 or top 50 export products by country ("Odoriferous substances and mixtures"), and given the only marginal loss of information, the Project Team did not sample firms from this sector.

4.3 List of leading national and leading EU export sectors

This section describes the top export sectors of each of the 11 countries under study and for the EU-27 as a whole. For the countries included both in our and in Porter (1990)'s study, i.e. Germany, Sweden and Italy, the Project Team also highlighted if and how our findings differ from those obtained by Porter (1990).

The methodology we adopted to identify the top export products is described in section 4.2.1. For presentation purposes, in this section we report findings for broad groupings of products rather than at the individual product level. In particular, the HS6 product categories were first aggregated into HS2 categories, and then further aggregated to obtain 10 broad product groups (hereinafter, also referred to as "sectors" for simplicity). The mapping of each HS6 product into one of those 10 product groups is shown in Annex D.3.

Table 4.1 below lists, for each country and for the EU-27, the top export sectors created following this approach, as well as the value of extra EU exports by sector (with reference to the top 20 export products belonging to the sector). In particular, this means that for a specific export sector in a given country, the table does not provide the overall value of extra EU exports of that sector, but the value of exports including only those of the top 20 export products of the country that fall into that sector. Where for a specific country the value of extra EU exports of a sector is not reported in the table, it means that none of the top 20 export products of the country fall into that sector (e.g. Wood & Wood products for France). The last row of the table shows the total share of the extra EU exports of the country represented by the top 20 export products of that country. Interestingly, for all countries the top 20 export products represent a fairly significant share of extra EU exports, but in certain countries they represent a much larger share than in others. For example, in Belgium, France, Czech Republic and Romania they constitute more than 25% of the country's exports outside the EU. In Spain, Italy and Poland the top 20 export products represent a much lower share of extra EU exports (13 to 16%).

The following subsections provide a description of the top export sectors at the country level and for the EU-27 as a whole. For completeness, the tables in Annex D.1 show, for each country, the top 20 exported products at the HS6 level, and include for each of

these products the value of extra EU exports and the country's share of extra EU exports.[305]

[305] *It should be noted that differences between our and Porter's results may be due to two main reasons: i) differences in the methodology adopted to identify the top export products, and ii) differences in the export mix resulting from the passage of time. Concerning the methodological approach, as explained in Box 4.1: Porter (1990)'s approach and key results, Porter identified the top export products primarily based on the share of the country in the worldwide trade of the product (i.e. requiring this to be equal or above the nation's average share of world trade in the year), and secondly adding industries where the nation's firms had made substantial foreign direct investments. Our approach differs in that we consider the share of worldwide exports, but we come up with the final ranking by combining it with the country's export value for each product, and do not rely on foreign direct investments data. Despite this may explain some differences between our and Porter's results at the product level, we believe that the overall results at sector level, which reflect the aggregation of multiple products into each sector, should not be significantly affected by such methodological differences. For example, our analysis shows that Germany is very strong in the export of Transportation products (in particular motor cars and motor vehicles: 5 products in Germany's top 20 belong to this sector), and it is unlikely that this strength is not picked up by Porter's methodology. Consequently, we believe that most of the differences we detect between our and Porter (1990)'s results at sector level are due to genuine differences in the export mix over time.*

Table 4.1: Top export sectors per Member State and for the EU-27, 2021

	Extra-EU export value, bn (ranking of the sector in the country)[306]											
	EU	**FR**	**DE**	**ES**	**BE**	**NL**	**SE**	**AT**	**CZ**	**IT**	**PL**	**RO**
Animal products	6.9 (8)			4.0 (2)						0.8 (9)	0.3 (7)	0.2 (7)
Chemicals & Pharmaceuticals	209.3 (1)	12.1 (2)	32.2 (2)	1.5 (6)	39.5 (1)	1.8 (7)	1.3 (4)	3.7 (1)		1.5 (7)	0.4 (6)	0.1 (8)
Clothing and accessories	7.1 (7)	6.4 (5)								9.0 (1)		
Foodstuffs	18.7 (6)	11.1 (3)		1.7 (4)	1.3 (4)	3.9 (4)	0.6 (7)	1.2 (4)		6.8 (2)	0.8 (5)	0.2 (6)
Machinery / Electrical	70.4 (3)	6.9 (4)	25.3 (3)	0.5 (7)	1.1 (5)	16.6 (1)	0.8 (5)	1.5 (3)	3.5 (1)	3.2 (4)	1.7 (4)	0.4 (5)
Metal, stone and mineral products	22.0 (5)		3.5 (4)	3.2 (3)	9.0 (2)	2.9 (6)	2.5 (3)	1.6 (2)	0.6 (4)	1.8 (5)	1.7 (3)	0.6 (4)
Miscellaneous	27.3 (4)		2.5 (5)		1.7 (3)	7.3 (2)	0.8 (6)	0.2 (7)	2.2 (3)	1.7 (6)	2.0 (2)	
Transportation	200.3 (2)	19.0 (1)	82.0 (1)	4.8 (1)	0.6 (6)	5.0 (3)	2.9 (2)	0.6 (6)	3.0 (2)	4.9 (3)	3.5 (1)	0.8 (3)
Vegetable products		0.8 (6)		1.5 (5)		3.7 (5)				0.8 (8)		2.7 (1)
Wood & Wood products					0.4 (7)		4.6 (1)	1.1 (5)				0.8 (2)
Total share extra EU export of the country[307]	26.52%	26.15%	23.27%	14.51%	34.79%	20.53%	19.43%	20.29%	25.12%	13.10%	16%	29.94%

Source: Project Team based on ITC Trade Map data

4.3.1 Germany

Based on 2021 data, our analysis shows that by far the most important export sector for Germany is Transportation, driven by motor cars and aircraft and their parts, with the top 20 exported products in this group constituting 13.1% of the country's exports to countries outside the EU. The second most important export sector is represented by Chemicals & Pharmaceuticals (specifically various medicaments and human or animal blood), where the top 20 exported products account for 5.1% of total German exports outside the EU. The third top export sector is Machinery/ Electrical products (e.g.

[306] The table does not provide, for each country, the overall value of extra-EU exports of each sector, but the value of extra-EU exports including only those of the top 20 export products of the country that fall into that sector. For each country-sector, we show in brackets the position of the sector in the ranking (based on extra EU export values) of the top export sectors of the country.

[307] This row does not provide the overall country's share of world exports, but the share only including, for each sector, those of the top 20 export products of the country that fall into that sector.

vehicles' engines, machinery for filling or sealing bottles, plugs and sockets). Germany also has strong positions in precious metals (specifically rhodium).

Several of these sectors (machinery, metals, transportation equipment and related parts, and pharmaceutical products) were already the top exporting ones in 1985, i.e. at the time of Porter's analysis. However, the most important export sectors back then also included chemicals (e.g. plastics), printed materials and printing machinery and some food-related products (e.g. milk), which do not feature amongst the most important ones currently.

4.3.2 France

The list of top French export sectors showcases several French flagship products which are famous worldwide. By far the most important French export sector is represented by Transportation, driven by aircraft and their parts (where the top 20 exported products account for 8.8% of total French exports outside the EU), largely due to Airbus' production. Airbus is in fact one of the most important and well renowned French companies, employing 48,000 people in France.[308] The second top export sector is Chemicals & Pharmaceuticals (where the top 20 exported products account for 5.6% of French exports outside the EU), and the main exported products in this group are perfumery, cosmetic or toilet preparations. Amongst the most worldwide famous French perfume brands there are Lancome, Guerlain and Fragonard, while the French skincare gems include L'Oréal, Avène, La Roche-Posay, L'Occitane, Biotherm and Clarins. The third top export sector is foodstuffs, which reflects the exports of alcoholic beverages, with notorious French products such as wine and cognac (5.2% of French exports outside the EU). France also has very strong positions in Clothing and accessories, specifically handbags and leather cases, and women's track suits.

4.3.3 Italy

We found that the most important Italian export sector is represented Clothing and accessories, where the top 20 exported products represent 3.8% of total Italian exports outside the EU driven by leather handbags and cases, and leather footwear. The second top export sector is represented by Foodstuff (where the top 20 exported products account for 2.9% of total Italian exports outside the EU), including wine, pasta, olive oil and cheese. The third and fourth key export sectors are Transportation (mainly ships and boats, accounting for 2.1% of total Italian exports outside the EU) and Machinery/ Electrical products. Italy also has very strong positions exporting ceramic tiles, tobacco and pharmaceutical products.

The presence on the list of such industries as wine, handbags, footwear and typical Italian food is not surprising. More interesting is the presence (and relatively high share of Italian exports) of a range of machinery and mechanical appliances. Moreover, what is immediately striking about Italy is the fact that the top 20 export products represent a lower share of total exports compared to other countries and that no small number of industries dominates exports. This was already a finding in Porter's 1985 analysis. Moreover, the main Italian export sectors and products have not changed compared to 1985.

4.3.4 Spain

The most important export sector for Spain is Transportation, where the top 20 exported products represent 4.1% of Spanish exports outside the EU, driven by exports of motor

[308] *https://www.airbus.com/en/our-worldwide-presence/airbus-in-europe/airbus-in-france*

cars as well as vehicles for the transport of goods. This is closely followed by the exports of Animal products, in particular meat (3.4% of total exports outside the EU; pork derived products play a particularly relevant role in this sense), and Metal, stone and mineral products (where the top 20 exported products account for 2.8% of total exports). Spain also has very strong positions in specific products such as ceramic tiles, olive oil, wine and perfumes.

4.3.5 Austria

Austria's top export sector is represented by Chemicals & Pharmaceuticals (mainly medicaments and human or animal blood), where the top 20 exported products account for 7.5% of total Austrian exports outside the EU. The second and third most important export sectors are Metal, stone and mineral products (mainly metal products, e.g. for furniture) and Machinery/ Electrical (engines, elevators for goods, teleferics and machinery for working rubber or plastics), where the top 20 exported products represent respectively 3.2% and 3.1% of Austrian exports outside the EU. Austria also has strong positions in Foodstuffs (mainly soft drinks like sweetened or flavoured waters), Wood & Wood products, and Transportation (driven by motor cars and railway vehicles).

4.3.6 Belgium

By far the most important export sector for Belgium is represented by Chemicals & Pharmaceuticals, with the top 20 exported products in this group (medicaments, vaccines and goods such as suture materials and tissue adhesives) constituting 25.6% of the country's exports outside the EU. The second top export sector is constituted by Metal, stone and mineral products (in particular precious stones and metals, like diamonds and platinum), where the top 20 exported products represent 5.8% of Belgium's exports outside the EU. The remaining top export sectors each account for less than 1.2% of exports outside the EU, and include optical, photographic, medical instruments and apparatus, organic chemicals, mineral fuels, machinery and mechanical appliances (looms), vegetable preparations (frozen potatoes), tanks and other fighting vehicles, plastics, chocolate and wood.

4.3.7 Czech Republic

The two most important export sectors for Czech Republic are represented by Machinery/ Electrical products and their parts (pumps, automatic data processing machines and shovel loaders, automatic circuit breakers, plugs and sockets) and Transportation (motor cars and motor vehicles), with the top 20 exported products in these groups representing respectively 9.6% and 8.2% of total Czech's exports outside the EU. These are followed by a variety of products falling in the Miscellaneous group (e.g. toys, sanitary towels and napkin liners for babies, plastic articles) and Metal, stone and mineral products (especially precious stones and metals).

4.3.8 The Netherlands

The most important export sector for the Netherlands is represented by Machinery/ Electrical products (specifically machinery for the manufacture of semiconductor devices or of electronic integrated circuits), constituting 8.3% of the country's exports outside the EU. The second top export sector is constituted by products falling in the Miscellaneous group (specifically medical and surgical instruments), which account for 3.6% of Duch exports outside the EU. The Netherlands also has strong positions in Transportation (ships and boats), Foodstuffs (such as preparations of cereals, flour, starch or milk, beer, frozen potatoes), and Vegetable products (plants and flowers). These are followed by mineral fuels as well as pharmaceutical products and radioactive chemical elements.

4.3.9 Poland

The most important export sector for Poland is Transportation (mainly ships and boats), accounting for 5.2% of Polish exports outside the EU. Second and third in the list are products in the Miscellaneous group (furniture, and photographic or medical instruments) and Metal, stone and mineral products (e.g. precious metals like silver, and metal products like caps and lids), where the top 20 exported products account respectively for 3% and 2.7% of Polish exports outside the EU. These are followed by a variety of other products, such as tobacco, chocolate, soaps, and meat.

4.3.10 Romania

The top export sector for Romania is by far Vegetable products (cereals like wheat, maize and barley), with the top 20 exported products accounting for 13% of total Romanian exports outside the EU. The second to fourth top export sectors are Wood & Wood products, Transportation (motor vehicles, and ships and boats) and Metal, stone and mineral products, where the top 20 exported products represent respectively 4.4%, 4.3% and 3.6% of Romanian exports outside the EU. Other key export sectors are Machinery / Electrical products (vehicle engines), live animals (sheeps), and Chemicals & Pharmaceuticals (shampoo).

4.3.11 Sweden

The two most important Swedish export sectors are Wood & Wood products (including paper and paperboard) and Transportation (cars, tractors and vehicles for the transport of goods), where the top 20 exported products account for 6.6% and 4.1% of Swedish exports outside the EU respectively. The third and fourth top export sectors are respectively Metal, stone and mineral products (mainly iron ores and concentrates) and Chemicals & Pharmaceuticals (mainly pharmaceutical products). Other important export products are tobacco, electrical machinery, alcoholic beverages (vodka), various instruments and apparatus (chromatographs and electrophoresis instruments), and plastic products.

Compared to 1985, the top export sectors have remained largely the same, although their order in the ranking of the top Swedish export sectors has somewhat changed. For example, the first most important export sector in 1985 was paper, followed by wood and metals in the second and third place respectively. Notably, in 1985 Sweden's list contained many natural resource-related industries as well as a variety of machinery and mechanical industries, and it still does today.

4.3.12 European Union as a whole

The Project Team also identified the top 40 exported products by the EU-27 as a whole. The top EU export sectors largely reflect the top national export sectors described in the previous sections. Considering products defined at the HS-6 level, 28 products at the EU-27 level are present in the top 20 of at least one country under analysis, while 11 are not in the top 20 but are present in the top 50 list. Only one product ("Odoriferous substances and mixtures") is not present in the top 50 ranking in any of the countries under analysis.

The two most important EU export sectors are Chemicals & Pharmaceuticals (pharmaceutical products, perfumes and skincare products) and Transportation (motor cars, aircrafts and their parts), with the top 40 EU-27 exported products representing

respectively 9.9% and 9.4% of the EU's exports.[309] The EU also has very strong positions in Machinery / Electrical products (e.g. machines for the manufacture of semiconductor devices, taps and valves for pipes and tanks). These are followed by a wide range of other sectors, such as Miscellaneous (e.g. articles of plastics), Foodstuff (wine), Metal, stone and mineral products (precious stones and metals like diamonds), and Clothing and accessories (handbags).

4.4 Survey results

Following the identification of the export companies in the top export sectors, the Project Team carried out a survey of the identified companies in the 11 Member States selected. The survey was carried out with a standardised questionnaire and conducted via telephone (with an option to complete the survey online, if desired). The fieldwork in the countries took place between 17 August and 8 September 2023. A total number of 398 firms have been interviewed in the main business language of the country. At the beginning of the interview, the eligibility and the firm's status as exporter to non-EU countries was confirmed with a screening question. The survey achieved a response rate of 8.1%, higher than in comparable business surveys.[310] Potential respondents were approached following a contact strategy that included multiple stages and that encouraged their participation. The structure of the questionnaire and how the survey was implemented (including details of the achieved response rate) are described in Annex D.4. The full questionnaire is also included in Annex D.4.

This section describes the survey results, and the discussion is organised as follows. We first illustrate the characteristics of respondents in terms of size, age of the company, and export activity (section 4.4.1). We then analyse the most relevant factors affecting export success in the domestic markets where the respondents operate, namely competition in upstream markets (both for goods and for services) and in the market for their own product. Indeed, when asked about the importance of different factors for their competitiveness in global exports, many firms stressed the significant impact of competition in the markets for physical inputs (80%). This is consistent with the common view, also discussed in the above literature, that competition in upstream markets supports export success. The findings of the survey on this dimension will be discussed in section 4.4.2. Competition in the upstream markets for services also plays an important role for 67% of the interviewees and will be discussed in section 4.4.3. We discuss competition in the domestic market for the own product in section 4.4.4, which is an important factor for 67% of the firms in the sample.[311] Section 4.4.5 investigates more explicitly how domestic competition is perceived to impact the export performance

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[309] *This number is computed based only on exports outside the EU. Since for the EU intra EU trade does not matter by definition, it was not specified in the main text.*

[310] *This is the overall response rate of the study in telephone mode. It is calculated as the ratio between completed interviews in telephone mode (352, as the remaining 46 were online completes) and all respondents in the sample list that are eligible plus the estimated share of eligible respondents among those where eligibility is unknown (overall, 4346 firms).*

For comparison, the EIB Investment Survey (EIBIS), a yearly telephone survey by the European Investment Bank of around 13,300 businesses, reaches a response rate of 4%, detailed information available at https://www.eib.org/attachments/eibis-methodology-report-en.pdf. https://www.eib.org/attachments/eibis-methodology-report-en.pdfEurofound's European Company Survey (ECS) has a telephone response rate of 5%, information available at: https://www.eurofound.europa.eu/en/surveys/european-company-surveys/european-company-survey-2019/ecs-2019-methodology.

[311] *According to our survey, there are other factors, such as labour costs and workforce skills, that appear to have a relevant influence on the export performance of the respondent. However, being the latter factors out of the scope of the study, they will not be further investigated in this section.*

of firms and the related channels. Finally, in section 4.4.6, we discuss the evolution of market competition, both upstream and in the own product market, over the past 10 years.

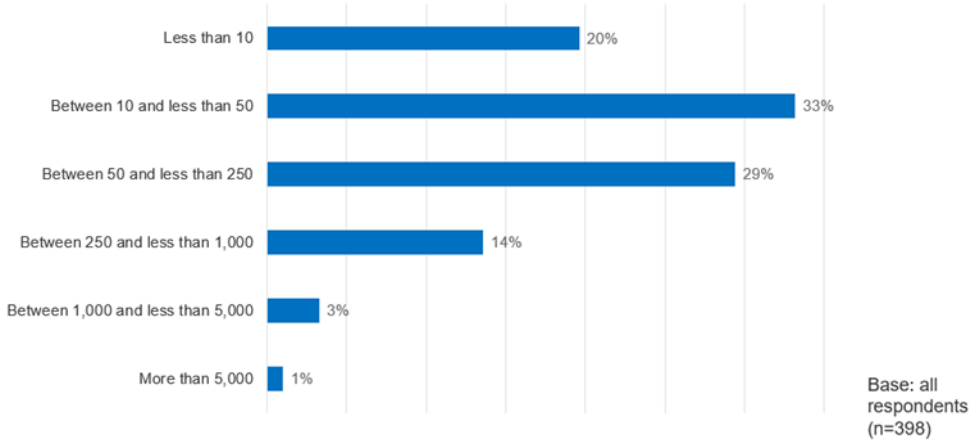
The discussion below focuses on the main findings from the survey. We investigate the key questions on the impact of competition on export success by performing a set of breakdowns of the answers by sector or by perceived market concentration. The latter analyses are intended at qualifying the answers to the main questions, and, in particular, at understanding whether the perceived impact of competition on export performance depends on the degree of market concentration or on the specific sector in which the firm operates.

In order to undertake the breakdown by sector, the products were grouped into the same 10 broader product groups presented in section 4.3, as these were found to have a reasonable number of firms each. Indeed, the sample includes a small number of firms for each product at the HS6 level, which does not allow us to draw meaningful conclusions at this level of disaggregation, except for some categories. For some HS6 product categories, instead, the survey sample contains a considerable number of firms in some countries, which allows us to discuss some findings for these specific categories. The mapping of each HS6 product into one of those 10 product groups is shown in Annex D.3.

4.4.1 Characteristics of respondents

As mentioned above, two parameters are considered to assess the size of the survey respondents, i.e., the number of employees and the turnover (considered in the last operating year). With regard to the former, the most populated category is the one between 10 and 50 employees, where 33% of the firms (132) position themselves. On the other hand, the smallest group counts only four firms, and is the one including firms with more than 5,000 employees.

Figure 4.3: Number of employees

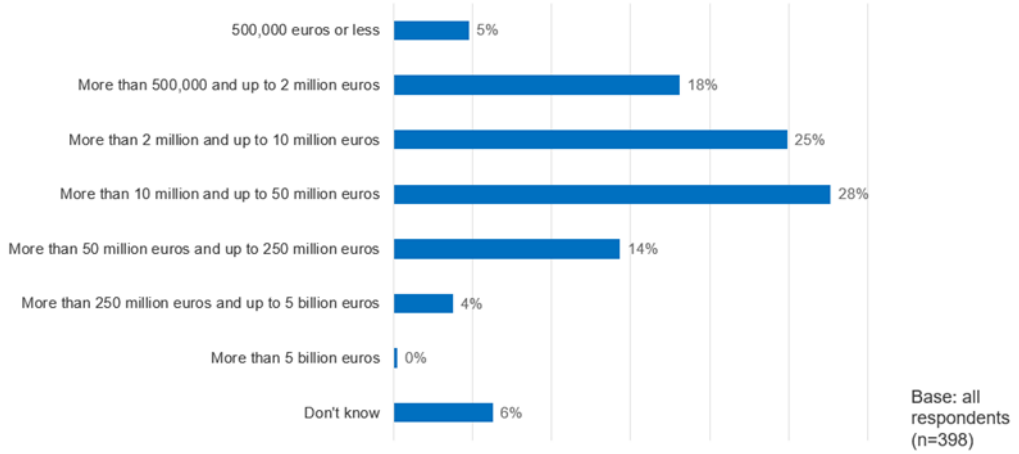


Source: Project Team

In terms of turnover, the sample is rather evenly distributed, with the central brackets displaying the highest shares of enterprises (Figure 4.4). In particular, the most populated category is the one including firms with a turnover between 10 and 50 million euros, which accounts for 28% of the respondents. Right after come the groups with 2-10 million euros of turnover (25%) and with 0.5-2 million euros (18%). On the other hand, the less populated category is once again the upper end of the distribution, with 4% of the firms reporting a turnover higher than 250 million euros. Based on firms'

answers concerning their number of employees and turnover, 74% of our respondents meet the definition of small and medium-sized enterprises (SMEs), while the remaining 26% are either mid-caps or large firms (as either their number of employees or turnover exceeds the threshold value for SMEs).312 The fact that the majority of respondents are SMEs is consistent with Simon (2009), who stresses that successful exporters are not necessarily large firms.

Figure 4.4: Turnover of the firms



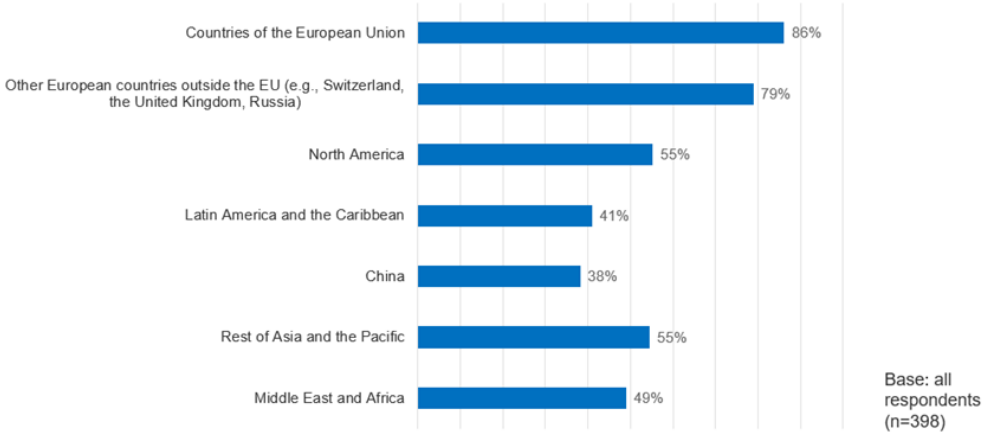
Source: Project Team

The other characteristic analysed in the survey is the age of respondents. On this matter, the results are more homogeneous, although it must be noticed that only three wide categories are considered. Nonetheless, a major part of the firms (59%) declared an age between 10 and 50 years old, while only a small fraction of the sample (2%) is younger than 10 years. This finding, reported in Figure D.9 of the Annex, shows that the firms in the sample are relatively old and established.

Moving to questions more related to firms' exports, respondents were also asked to report to which international markets they exported their product to during the years 2019–2022. Not surprisingly, 86% of the companies operated in countries within the European Union, and almost as many shipped their products to European countries not belonging to EU. As for extra-Europe countries, the most popular trading partners are North America and Asia and the Pacific (excluding China), which are served by 55% of the respondents.

[312] *For a definition of SME, see: https://single-market-economy.ec.europa.eu/smes/sme-definition_en. Mid-caps are a sub-group of large enterprises whose number of employees does not exceed 1,500 (see: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2021.508.01.0001.01.ENG)*

Figure 4.5: World regions to which the company exports



Source: Project Team

To further assess the extent of their business operations, the Project Team also collected information on the number of countries outside the European Union where the respondents export their products. The results (shown in Figure D.3 of the Annex) indicate that almost half of the sample serves from 1 to 5 extra-EU countries, 36% between 6 and 20 and 21% serve more than 20 countries.

The survey also asked some questions about the number of competitors in the main export market outside the EU (see Figures in Annex D.6.1). 30% of the respondents declares to have up to 2 competitors from their own country, 47% declares to have 3 to 10 competitors, and 17% more than 10. With respect to competitors from other EU countries, 22% declares up to 2 credible competitors, 41% 3 to 10 competitors, and 27% more than 10. Finally, with respect to competitors from non-EU countries, 24% perceives up to 2 credible competitors, 30% 3 to 10 competitors, and 30% more than 10.

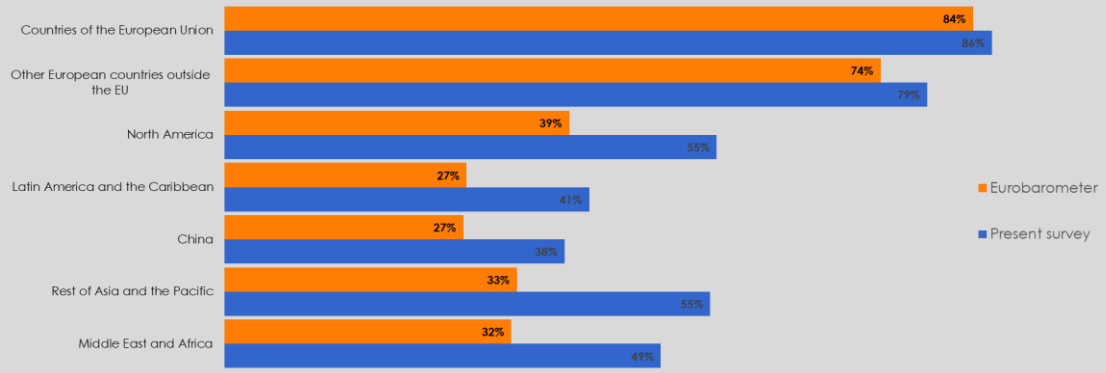
Box 4.3: Comparison with Flash Eurobarometer 486

To better understand whether our respondents can be considered more successful than the average exporter, the Project Team carried out a comparison with the results of another recent survey of firms by the European Commission, i.e., the Flash Eurobarometer 486[313]. The Flash Eurobarometer 486 is a representative business survey that sampled companies from a broad range of sectors and was conducted via telephone in EU and non-EU countries.

For the analysis, we compared the firmographic profiles of extra-EU exporters in the 11 countries from the Eurobarometer survey (which constitute about 26% of the sample) with the profiles of the companies that were included in the survey at hand. The detailed figures informing such comparison are reported in Annex D.6.1. This comparison indicates that our respondents are on average larger firms, both in terms of number of employees and of turnover. The difference is also rather substantial, if we consider that 46% of our respondents has a turnover higher than 10 million euros, while in the Eurobarometer only 18% of extra-EU exporters cross this threshold. A similar result can be observed comparing the age of the companies: indeed, our firms are on average significantly older than the Eurobarometer counterpart.

Lastly, and interestingly, respondents to this survey appear to export more frequently to every area considered in the study, with the difference getting wider when considering countries outside the European area (Figure 4.6).

Figure 4.6: Number of exporters by geographic area



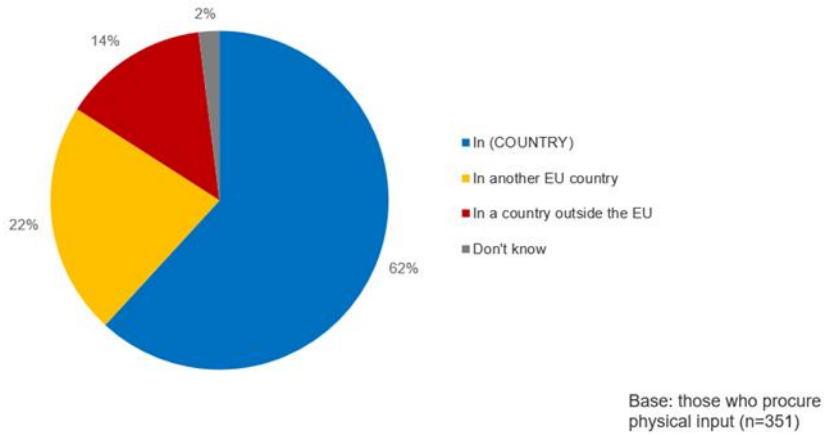
Source: Project Team based on current survey and Flash Eurobarometer 486 data

4.4.2 Input markets for goods

The first question asked to the firms is where they procure their main physical input. As can be seen in Figure 4.7, there is an overall trend to purchase the goods necessary for the production in the companies' own country, which is reasonable considering the likely lower transportation costs. However, 36% of the respondents declare to buy them from foreign countries; this could be due to the scarcity of the required input or differences in terms of price or quality. It is notable though that 84% of respondents procure their main inputs in the EU, which confirms that domestic competition in upstream markets can have substantial effects for our respondents.

[313] See: https://europa.eu/eurobarometer/surveys/detail/2244.

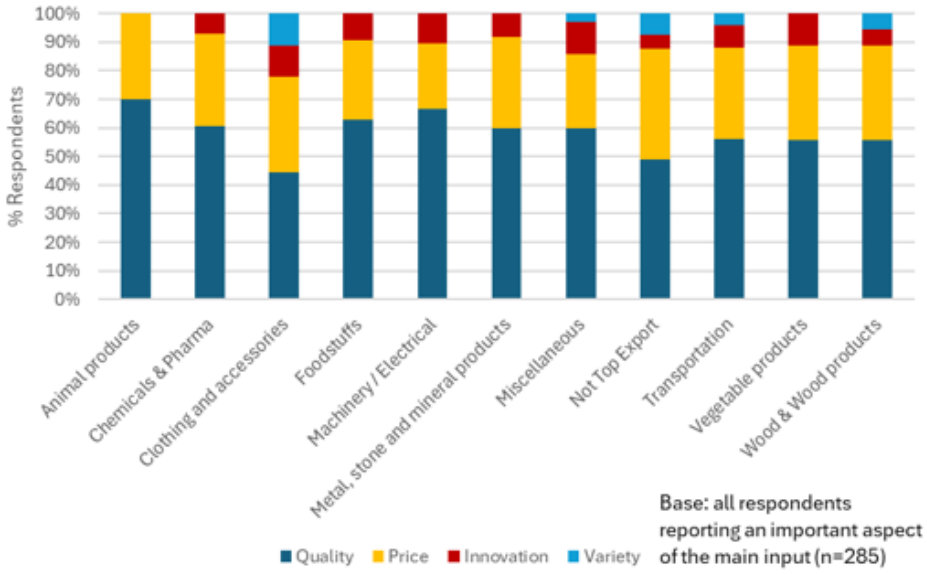
Figure 4.7: Place of procurement of main input



Source: Project Team

To understand what the main driver of competition in the upstream market is, the questionnaire investigated which aspect of companies' main input is the most important in enabling them to be successful on global export markets. Given that the study focuses on domestic competition (i.e., within EU), this question was asked to those firms that purchase their input in the European market.

Figure 4.8: Most important aspect of the main input, by sector



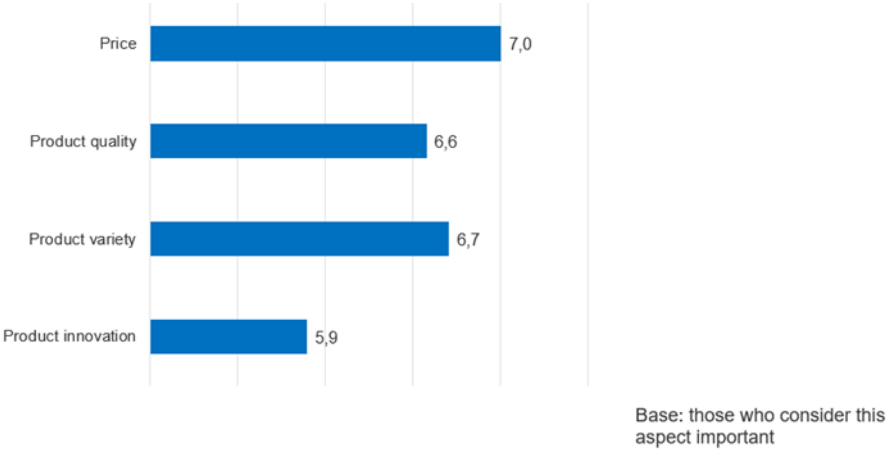
Source: Project Team

As shown in Figure 4.8, which highlights results by sector, the main feature the respondents care about is clearly the quality of the input, which was mentioned by at least 40% of firms in each sector and by more than 50% in all but two sectors (up to 70% for animal products). The price of input goods appears to be the second driver of success in exports by importance, while lower importance is given to innovation and product variety. Variety was not mentioned in many sectors, such as Animal products, Chemicals & Pharmaceuticals, and Machinery/electrical.

Interestingly, the importance given to the aspects mentioned above does not completely reflect the intensity of competition on them among suppliers. Overall, the survey

suggests that competition in the upstream markets is relatively effective on all four dimensions, as highlighted in Figure 4.9. With a score of 7 out of 10, price is the factor with the greatest perceived intensity of competition, followed by variety, while quality gets only the third place, although the perceived level of competition is very similar for the latter two items.

Figure 4.9: Intensity of competition on different aspects among suppliers (scores on scale 0-10)

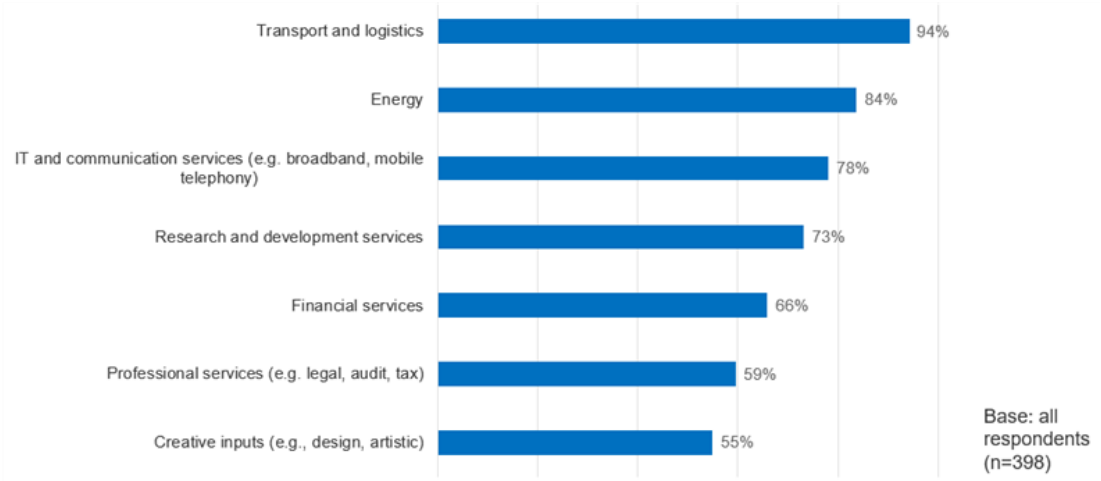


Source: Project Team

4.4.3 Input markets for services

Concerning input markets for services, as shown in Figure 4.10, we found that Transport and logistics is by far perceived as the most important service, as 94% of respondents said it is important for their export competitiveness. It is followed by energy, IT and communication services, and R&D services. Less important, according to our respondents, are financial services, professional services and creative services.

Figure 4.10: Perceived importance of upstream services

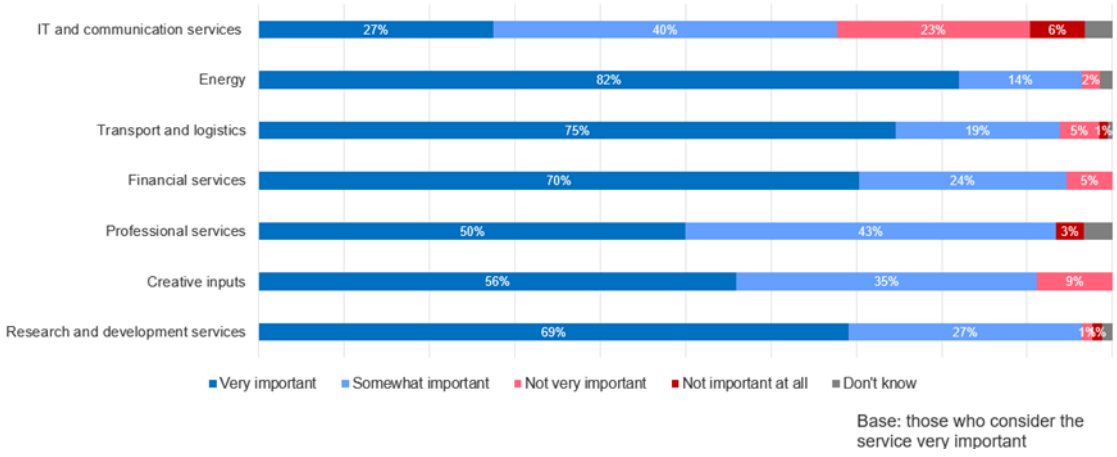


Source: Project Team

Each service may also have a different aspect that buyers consider crucial to succeed in global export markets. The following analysis focuses on price and quality as the key factors. Regarding the former, Figure 4.11 shows how, for most of the services, the price of the service input is perceived to be an important factor impacting export

competitiveness. This is particularly true for services with high standardization like energy (82%) and financial services (70%). IT and communication services seem to be the exception here, with only 27% of respondents considering their price very important.

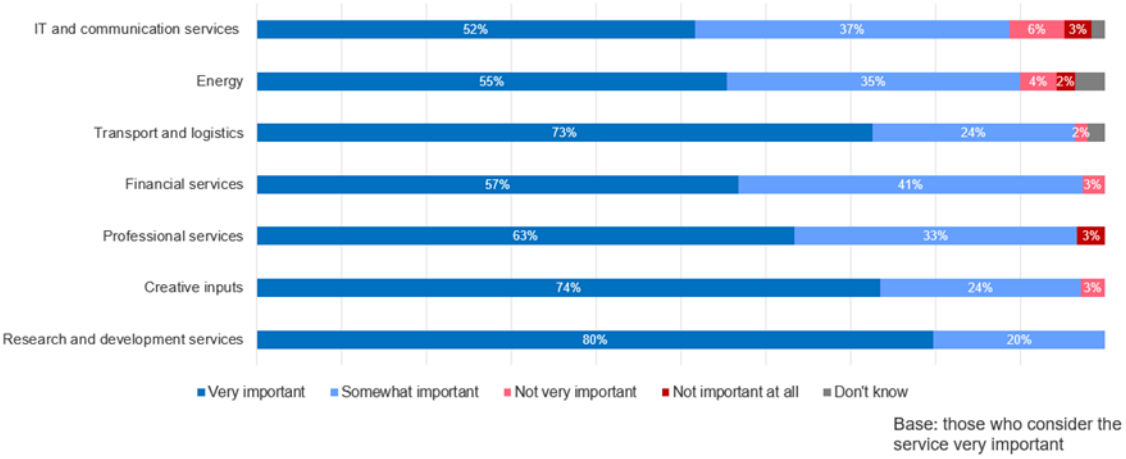
Figure 4.11: Importance of competitive pricing of upstream services



Source: Project Team

As far as quality is concerned, Figure 4.12 displays a general consensus among firms on its importance. The services for which it seems to be more crucial are creative services, logistics and R&D, where more than 70% of the respondents perceive quality as a "very important" feature. On the other hand, in relative terms, IT and communication services' quality is not regarded as particularly important. Combining the results of the two figures, it can be noticed that for creative services there is a rather clear preference for quality over price (in Figure 4.11 the importance given to their price is low compared to other services), while for R&D and logistics both quality and price highly matter.

Figure 4.12: Importance of high quality of upstream services

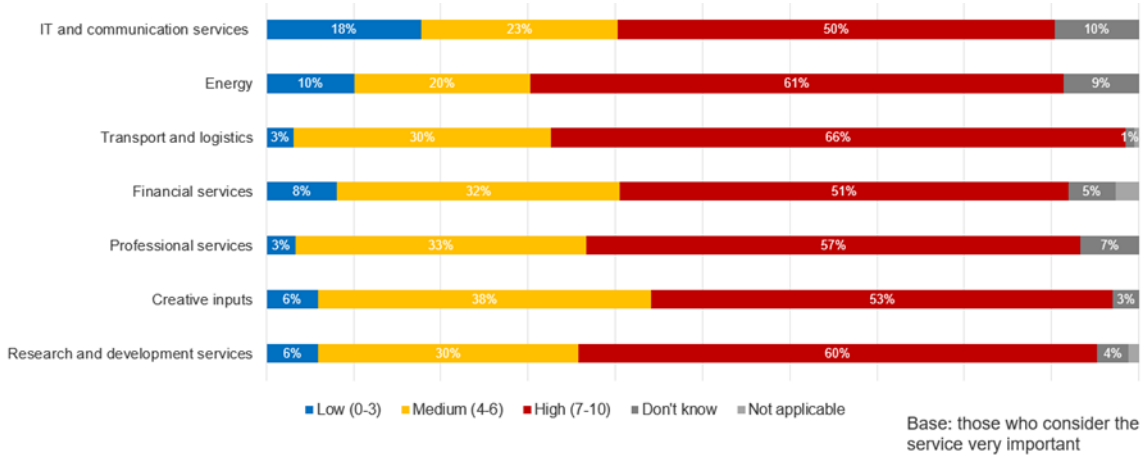


Source: Project Team

The last step of the analysis of the input markets for services focuses, as for the goods, on the perceived intensity of competition in the upstream market. The survey shows rather homogeneous results across services. More than 50% of the respondents consider competition for each service to be effective, and, excluding IT and communication services, less than 10% of them perceive it to be weak. Among all the

services, Transport and logistics appears to be the one where competition is perceived to be most effective. Competition in these services might play an important role for these firms, which export to countries outside the EU and hence face important challenges in terms of delivery of their products. Finally, similarly to what we observed in upstream markets for goods, we note that the intensity of competition in the upstream markets for services reflects only to a little extent the different levels of importance given by respondents to the services considered. However, as noted above, these results stem from buyers' perception and may not depict the actual intensity of competition faced by suppliers.

Figure 4.13: Intensity of competition in market for upstream services

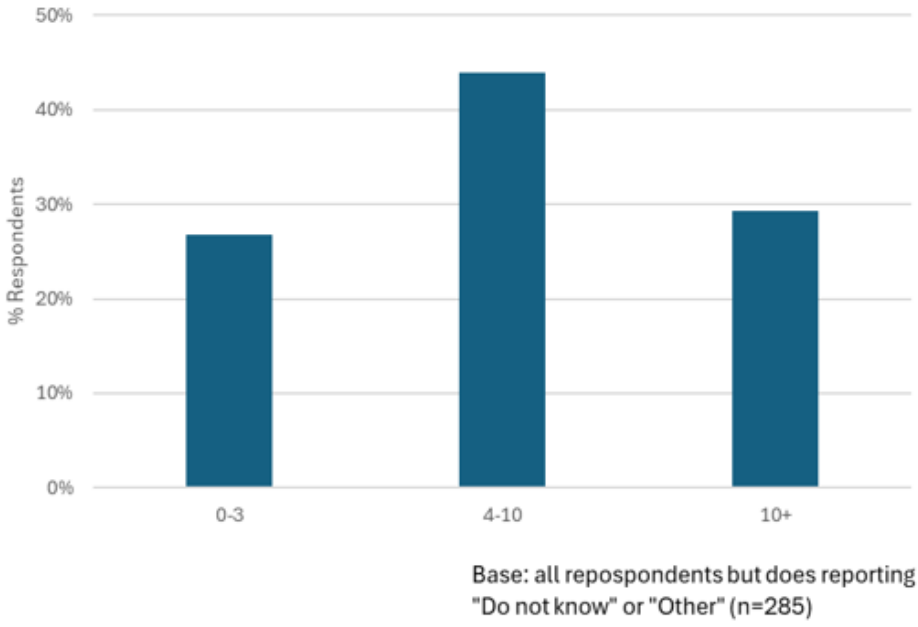


Source: Project Team

4.4.4 Domestic market for the export product

This section of the survey sought to characterise what is the level of competition that respondents face in the domestic market and what are the main aspects of their export products over which companies compete. A way to have an indication about the perceived level of domestic competition by respondents is to look at how many firms they consider to be their credible competitors on this market. As reported in Figure 4.14, firms in our sample reported a medium number of competitors in about 45% of the cases, with 4 to 10 credible competitors for their products. The remaining firms were almost evenly split between a higher number of competitors (10 or more firms) and a lower number of competitors (3 or less competitors). Based on this evidence, it appears that respondents identified, in most cases, a non-negligible number of firms as credible competitors. This suggests that firms operating in these markets face a moderate level of competition which might prevent firms from acquiring prominent market positions and create incentives for improvement over time.

Figure 4.14: Number of perceived competitors in domestic market



Source: Project Team

This average pattern hides, however, substantial country heterogeneity. Figure D.29 in the Annex shows that, although a medium number of credible competitors (4 to 10 competitors) is reported in most countries (Austria, Belgium, Czech Republic, Germany, Poland, Romania, and Spain), the share of firms reporting a lower number of competitors varies substantially across countries with firms in Austria, Belgium, Germany and Netherlands reporting 3 or less competitors in about 40% of the cases.

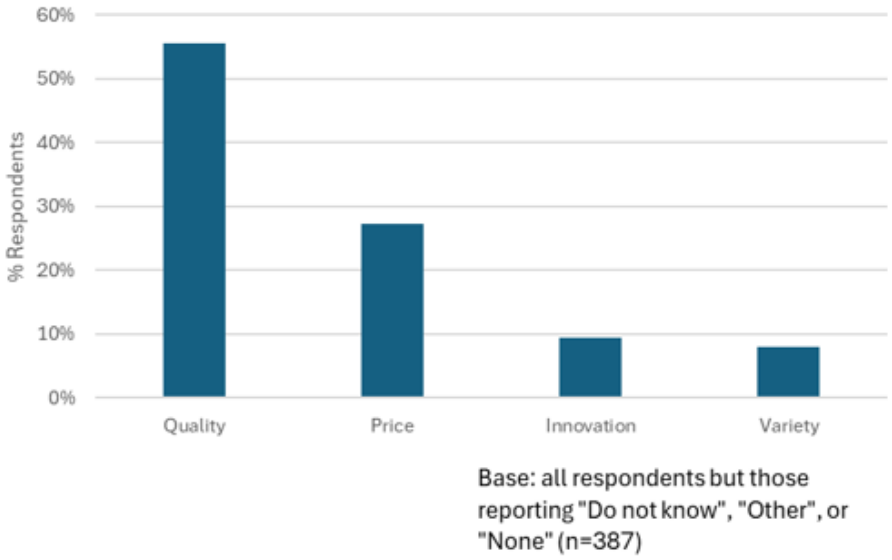
The variability across countries could be related to different economic conditions and state of maturity across different economies but it might also be related to the product mix which characterizes the exports of each country. Investigating the distribution of the number of reported credible competitors across sectors shows that this might be the case. Indeed, a representation of the number of competitors across product categories (Figure D.30 in the Annex) reveals that a number between 4 and 10 competitors is prevalent in most sectors, with less competitors (about 40% responding that they have 3 or less credible competitors) being reported for Chemicals, Machinery, and Wood products. A possible reason is that these products require more capital-intensive production processes or access to natural resources, which might prevent other firms entering the market at rates similar to other product categories.

In a few cases, reported in Figure D.31 in the Annex, in which it is possible to investigate patterns within product category but across countries (at least 5 answers for each sector by country), results suggest that the market structure might be related to the product characteristics rather than to the country environment. Indeed "Beverages" (mostly wines producers in our sample of respondents), which in our sample are present in sufficient number in France, Italy and Spain, show a similar pattern of answers with firms in all three countries reporting a high number of credible competitors, while firms exporting "Medical and measuring instruments" in Germany and Netherlands show generally higher levels of perceived market concentration. A less extreme pattern is instead observed for "Machinery and mechanical appliances" and "Vehicles other than Railway or Tramway Rolling Stock", where 4 to 10 credible competitors is reported by a high share of firms across countries. Although this evidence concerns a small number

of product groups, these results further stress that the characteristics of the products might be playing a strong role in determining the structure of the domestic market.

Several elements can determine the success of a product on the market. This depends on the nature of the product or on the competitive advantage of the firm in a specific aspect (e.g., a firm which can benefit from lower labor costs might find it easier to reduce prices while others might increase the quality or innovation of their products given a price level). The survey considered four relevant product dimensions: price, quality, innovation, and variety. Figure 4.15 reports which of these was the most relevant for the success of the product in the domestic market. Respondent firms clearly highlighted the role of quality for the success of their products, with about 55% of respondents indicating quality as the main driver for succeeding in the domestic market. Price also appears to be important with 27% of firms reporting that this was the main driver of success, while product innovation and variety were less important, with 9% and 8% shares of responses respectively. Domestic buyers for the top exported products for a country, hence, appear to place a higher value on the possibility of getting high quality products and seem to be less sensitive to prices. This might encourage firms to develop better products over time, which may in turn allow them to maintain a strong presence on international markets.

Figure 4.15: Most important aspect for product success in the domestic market



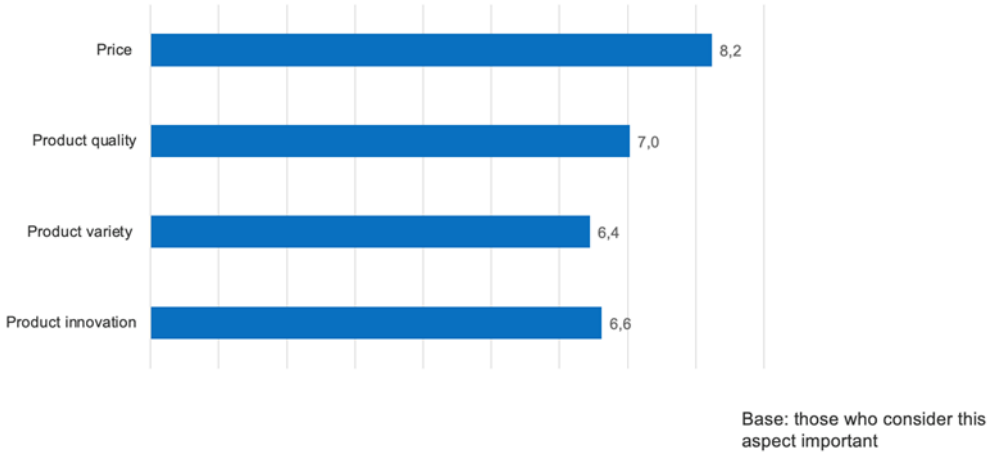
Source: Project Team

Survey results, reported in Figure 4.16, also show that firms perceive to face a medium to high level of competition in the aspects that they consider the most relevant for their success. The level of competition is reported as a score ranging from 0 to 10 with 0 being "not intense at all" and 10 "Very intense". The survey collects information on the level of competition only for the aspect that is indicated by firms as the main determinant of their competitiveness, hence it should be kept in mind that each column refers to a different set of firms. Price is the product dimension which shows the highest level of competition with an average score of 8.2, a whole point above the competition level for the second item, that is quality (with a score of 7). Competition over product innovation and variety is also fairly intense and similar to quality (about 6.5 for both items).

Overall, these results suggest that competition is especially fierce when firms compete on prices. It might be that the higher level of competition on prices is determined by

the simpler nature of this type of competition. Often, prices are readily observable by buyers and easier for firms to adjust with respect to other dimensions such as quality or variety, where more costly and/or lengthy processes might be needed for adjustments. In addition, buyers might take time to internalize changes in quality and other dimensions, which would make competing over these aspects more complex due to the presence of information asymmetries between buyers and sellers in the short run. The high reported degree of competition on prices also suggests that increasing efficiency in production can play a significant role in these markets as firms attempt to reduce prices to gain market share. Interestingly, this pattern does not show a marked heterogeneity across product categories. Responses across product categories confirm that there is strong competition for prices, with quality ranking second in most cases and relatively close to the two other dimensions (innovation and variety). An interesting exception is represented by Metal, stone and mineral products, where a strong competition on variety is also reported. This is driven by 4 firms producing ceramic and tiles which reported variety as the main driver of success. A higher competition in product variety appears reasonable for this business where products should match the preferences of consumers.

Figure 4.16: Level of competition by product aspect

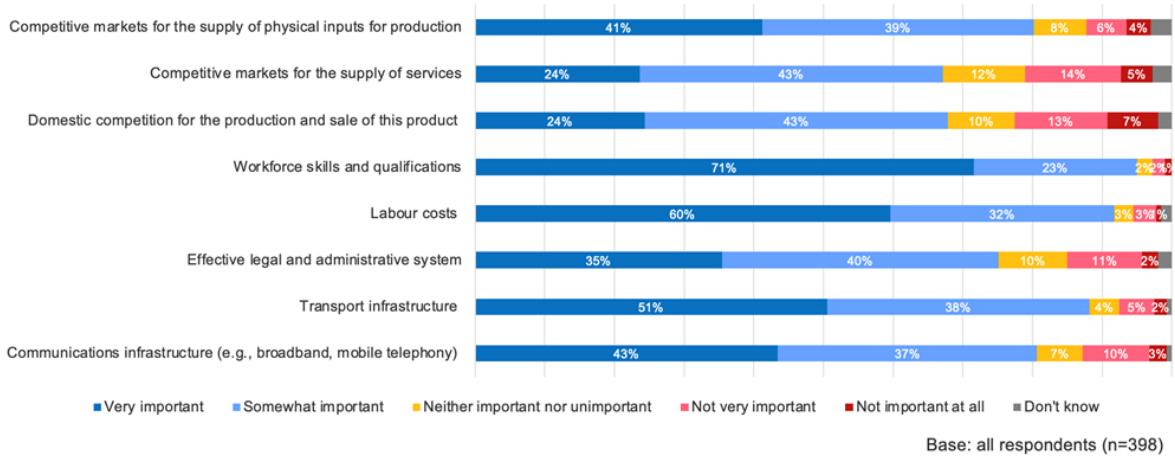


Source: Project Team

4.4.5 Impact of domestic competition

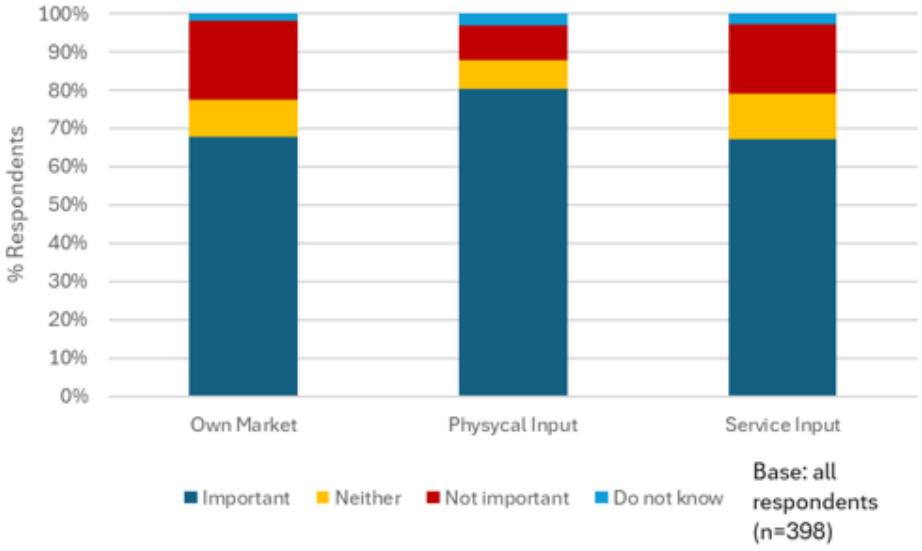
We asked respondents about the importance of several factors for firms' export success and found that the factors which are perceived to be most important are workforce skills (94%), labour costs (92%) and transport infrastructure (89%). Importantly, the vast majority of respondents also believe that competition in input markets, in services markets and in the own product market is important for success in export markets. Of the three, competition in input markets appears to be the most important factor, being reportedly important for 80% of respondents, versus 67% for both competitive markets for services and own product markets (see Figure 4.17 and Figure 4.18).

Figure 4.17: Perceived importance of country factors for company's success in export markets



Source: Project Team

Figure 4.18: Perceived importance of competition in input, services and own product markets for export success

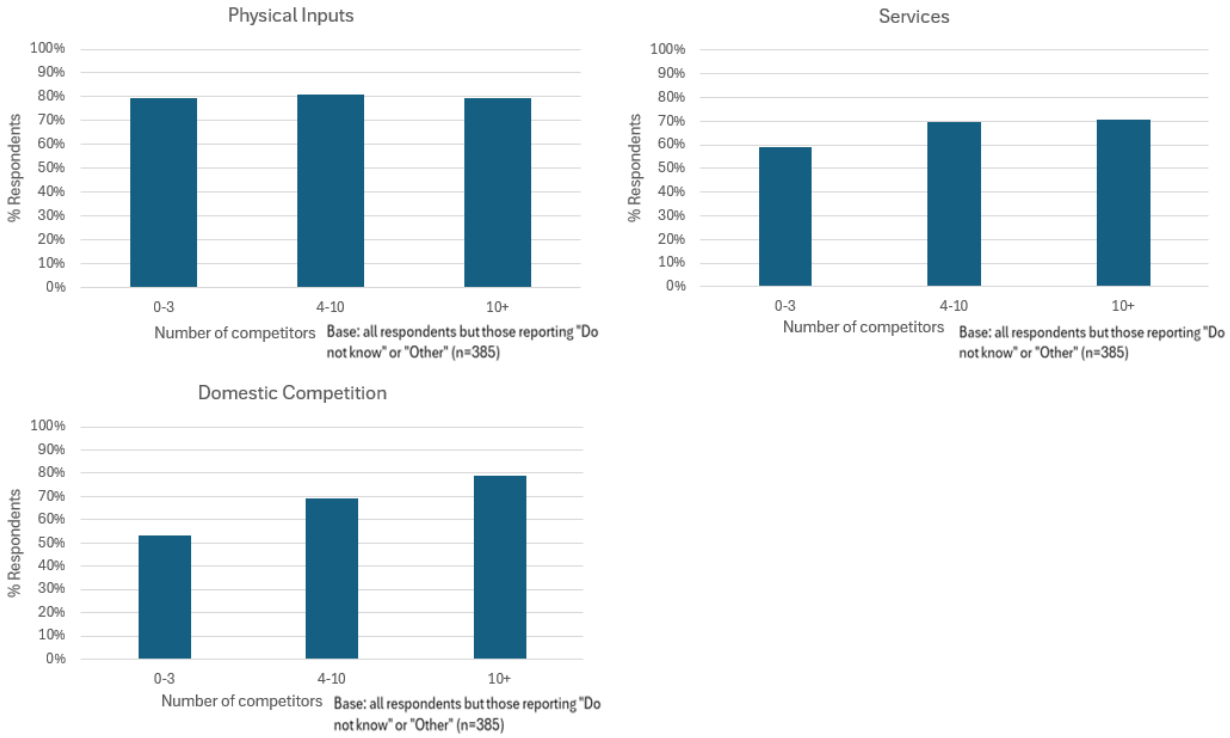


Source: Project Team

We also break down the answers to this question by the perceived level of market concentration (defined, as previously, based on the perceived number of domestic competitors, i.e. "0-3", "4-10" and "10+"). The figure below shows the proportion of respondents that said that competition in input markets, in services markets and in the market for the own product is important by the perceived level of concentration. Results show that the percentage of firms that think that competition in services markets and in the market for the own product is important for export success decreases with the perceived level of concentration. Instead, the percentage of respondents that think that competition in input markets is important does not depend on the perceived level of own-market concentration: it is very high (about 80%) regardless of that. The relevance of this factor has been stressed also by other recent work, in particular with respect to some categories of firms such as mid-caps. Such companies, which account for at least

14% of the respondents[314], have indeed shown in a past survey of the European Commission (European Commission, 2022) that one of the most important challenges they face relates to supply chain disruptions (52% of all respondents). Specifically, of those who identified supply chain disruption as a challenge, 41% are small mid-caps (250-499 employees) and 59% are large mid-caps (500-2999 employees). Thus, this survey, consistently with the literature, shows that competition in the supply of inputs is crucial for companies' competitiveness on the global stage.

Figure 4.19: Percentage of respondents for which competition in input, services and own product markets is important, by perceived number of competitors



Source: Project Team

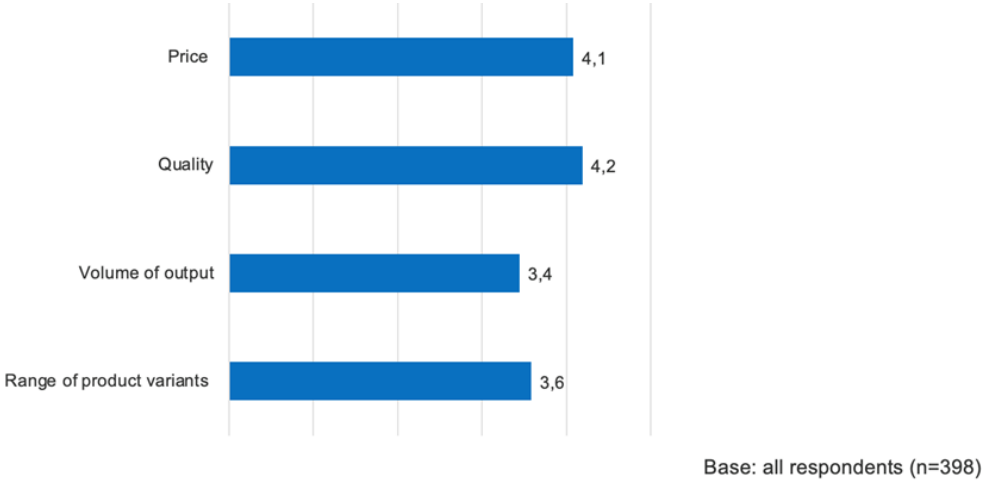
Having shown the perceived importance of effective competition in all three categories of markets, we now focus on the own product market and discuss, in the rest of this section, results concerning the impact of domestic competition (in the own market) on firms' performance.

The importance of product quality has already emerged from several responses, in particular as the most important aspect of input products and services for export success, and as the top aspect of the export product for success in the domestic market. Product quality is also perceived as the main dimension that is affected by domestic competition. Indeed, respondents reported that domestic competition highly affects companies' decision-making, and decisions regarding product quality are the first ones to be impacted by the intensity of competition in the domestic market for the main export product (with an average 4.2 score out of 5). These are closely followed by price

[314] *Unfortunately, the brackets of employees in the survey do not allow a precise computation of the percentage of mid-caps.*

decisions (average score of 4.1). Slightly less impacted are decisions regarding the range of product variants (average score of 3.6) and output volumes (average score of 3.4). This shows that, for our respondents, higher product quality and lower prices are the main outcomes of an effective competitive process. The importance of product quality as a prominent competitive factor for our sample of exporting firms is also suggestive that they may have another feature in common, besides their size, with the so-called "hidden champions", as defined by Simon (2009).

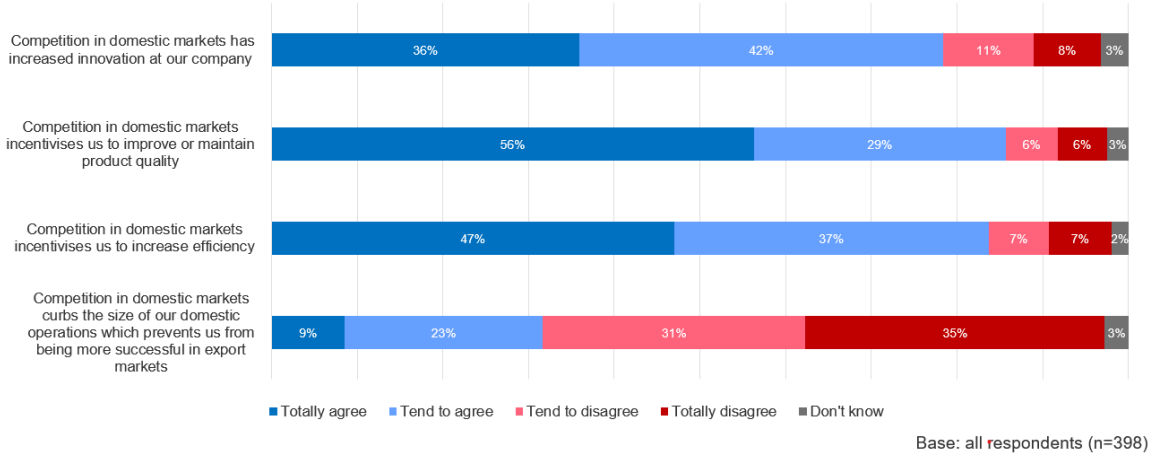
Figure 4.20: Impact of domestic competition on company decision making (average scores on scale 1-5)



Source: Project Team

One of the key goals of the survey was to investigate the channels through which domestic competition affects export performance. According to the literature reviewed in section 4.1, there are various potential channels through which domestic competition can affect export performance, both positively and negatively. On the one hand, domestic competition can incentivize firms to be more efficient, to improve product quality, and to innovate. On the other hand, according to other scholars, competition may prevent firms to reach a sufficient scale to be competitive in the foreign markets. The survey aimed therefore at identifying the relevance of these different channels. This issue was investigated both through a closed-answer question and through an open-answer question. The former identified the four main channels discussed above. The large majority of respondents reported that domestic competition has a positive impact on company performance. In particular, as shown in Figure 4.21, 85% of respondents said that domestic competition incentivises firms to improve or maintain product quality, 84% said it incentivises firms to increase efficiency, and 78% reported that it increased innovation at the company. The overwhelming majority of respondents disagreed with the statement that competition is detrimental for their performance, and, in fact 66%, of respondents said that domestic competition does not curb their size in a way damaging their export competitiveness. It is worth noting that, also in this answer, respondents identify product quality as the feature that is most impacted by domestic competition.

Figure 4.21: Views on the effect of competition on performance



Source: Project Team

Concerning the above-mentioned open-answer question, we specifically asked respondents to explain how the impact of domestic competition on exports would materialize (i.e. through which channels).[315] In most cases, respondents' answers can be traced back to one of the four channels described above: i) domestic competition increases company innovation (13% of respondents), ii) domestic competition incentivizes firms to improve quality (20%), iii) domestic competition increases efficiency (11%), and iv) domestic competition curbs the size of domestic operations, negatively impacting export performance (8%). Another 5% of respondents said that competition has a negative impact because it forces firms to lower prices (and thus lowers their margins). The rest of respondents identified other less prominent channels or offered answers that were too vague or not understandable. Some interesting quotes from respondents are reported in the figure below.

Figure 4.22: Impact of domestic competition on export performance – quotes

POSITIVE IMPACT

It forces actions that increase competitiveness on European markets - it forces constant care for the product and contact with the market - "when we feel the breath on our backs, we run faster"

Because of our competitors, we increasingly have to sit down with suppliers to ask suppliers for better condition, price and service to our customers. As a result, we also have to communicate more with the customer and provide better service, which also makes us stronger because we want to perform better than our competitors.

The fact that competitors are innovating the product means that we also do not stand still and that we have to continue innovating continuously.

NEGATIVE IMPACT

Increased competition and less profitability have resulted in less investment for exports.

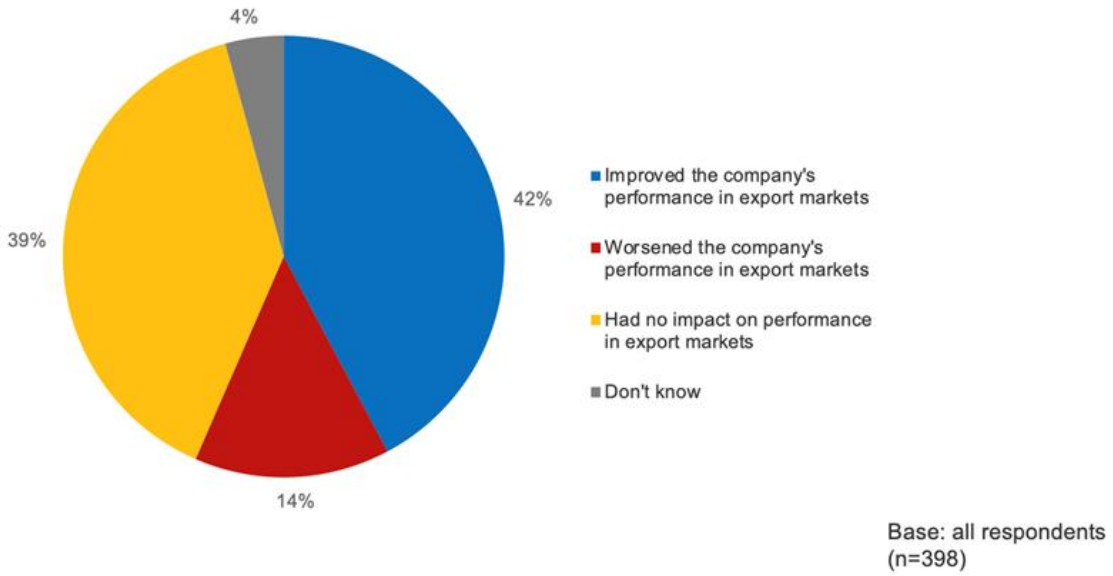
Competition in the domestic market for finished goods means that more people are exporting, which reduces our margin and profitability.

Source: Project Team

[315] *This question was only asked to those who responded that competition had an impact on export performance (56% of the sample, see below).*

When asked more generally about the impact that domestic competition had on export performance, 42% of respondents said that it improved the company's performance in export markets, 14% that it worsened the company's export performance, 39% that it had no impact on performance in export markets, and 4% did not know. These results are shown in Figure 4.23. Among the majority of respondents who think that competition has an impact on export success (56%), those who perceive a positive impact (42%) are therefore three times as many as those who perceive a negative effect (14%).

Figure 4.23: Effect of competitive pressure on performance in export markets

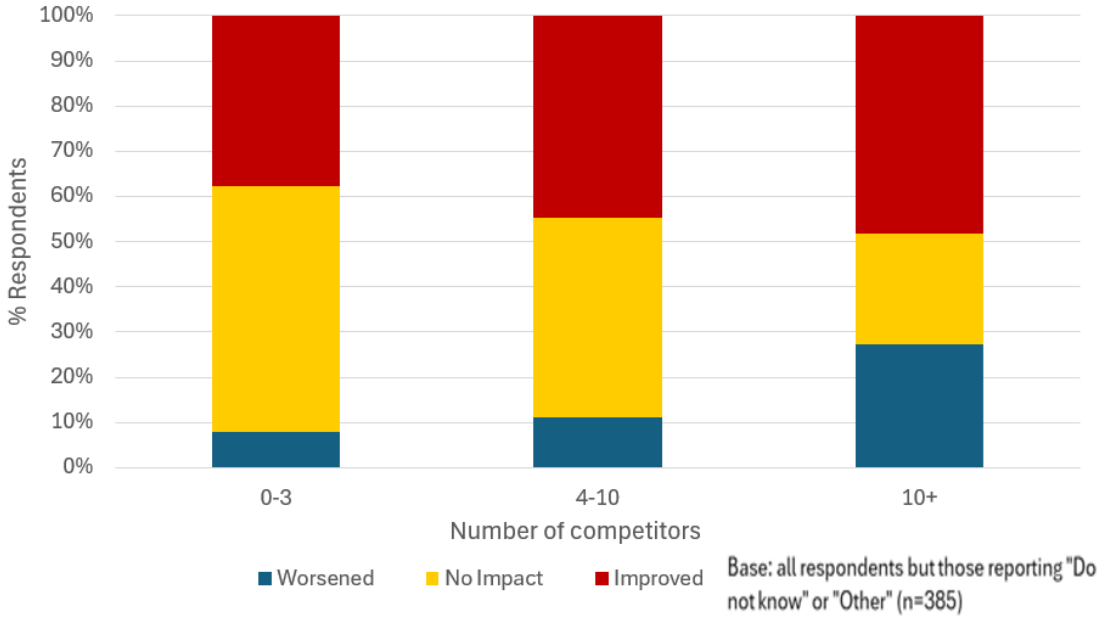


Source: Project Team

The above results differ highly between firms that operate in reportedly concentrated versus less concentrated markets. In particular, the proportion of respondents that thinks that competition improved export performance increases with the perceived number of competitors in the domestic market (i.e. it is 38% in markets with 0-3 firms, 45% in markets with 4-10 firms and 48% in markets with 11 or more firms). Similarly, the proportion of respondents that thinks that competition worsened export performance increases with the perceived number of competitors in the domestic market (i.e. it is 8% in markets with 0-3 firms, 11% in markets with 4-10 firms and 27% in markets with 11 or more firms). Instead, the percentage stating that competition has no impact on export performance decreases with the perceived number of competitors (from 54% in markets with 0-3 firms to 25% in markets with 11 or more firms).

These results are very telling, as they illustrate that the less markets are concentrated, the more firms feel that competition has an impact on export performance (independent of the direction of that impact). Instead, when markets are perceived to be very concentrated, typically firms believe that competition has no impact on their export performance. These results are shown in Figure 4.24 below. This finding can therefore at least partly explain the relatively high share of answers claiming that competition has no impact on export performance (39% in Figure 4.23): firms operating in very concentrated markets do not perceive competition as a driver of their export performance.

Figure 4.24: Effect of competitive pressure on performance in export markets, by perceived number of competitors in the domestic market



Source: Project Team

4.4.6 Market dynamics

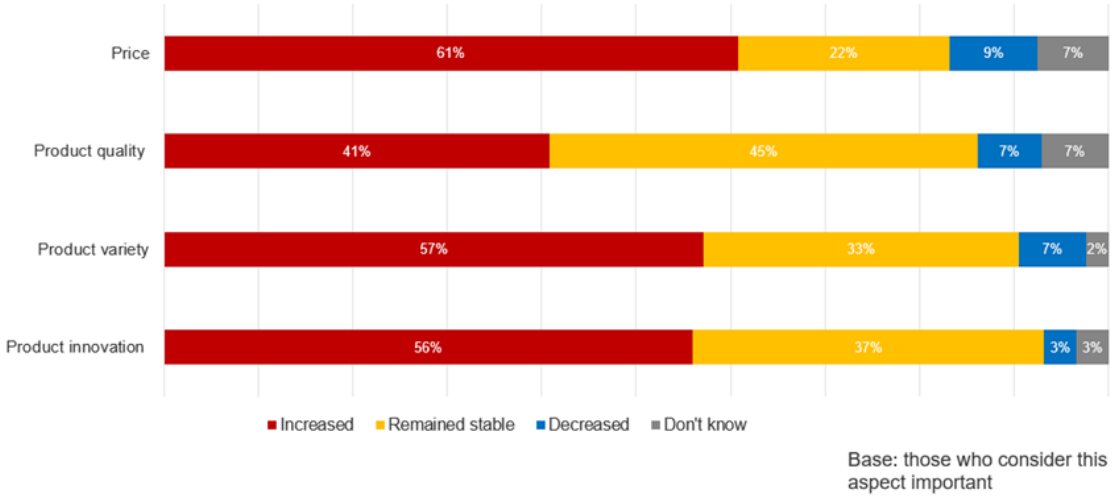
Over the last ten years, markets have changed in several aspects through the action and interaction of micro and macroeconomics factors. The last part of the survey here presented will not unveil the reasons behind these changes, but it will rather assess how such changes affected the intensity and the modalities of competition. This section is related to the discussion of the trends of competition indicators in section 1.3 The literature revised in section 1.3.1 generally suggests that the findings for the EU in terms of increasing concentration are more mixed than for the US. In particular, Bighelli et al (2023) find heterogenous patterns for concentration in the EU across countries and sectors.

In reading the survey results concerning the dynamics of competition, it should be noted that the perceived level and dynamics of competition reported by the firms in our sample may not be representative of the overall economy, since, as documented in the previous sections, firms operating in top export sectors may benefit from more competitive environments that drive their success. This may at least partly explain the trend of increasing competition that is generally reported by the respondents, as discussed in more depth below.

The survey includes questions on the perceived dynamics of competition in the domestic market at three levels: in the input market for goods, in the input market for services, and in the own market. We will therefore discuss the findings on these three aspects separately.

In the input markets for goods, respondents perceive that the level of competition has increased in the past 10 years over three out of the four dimensions analysed in section 4.4.2, with the higher change experienced by competition on prices (Figure 4.25).

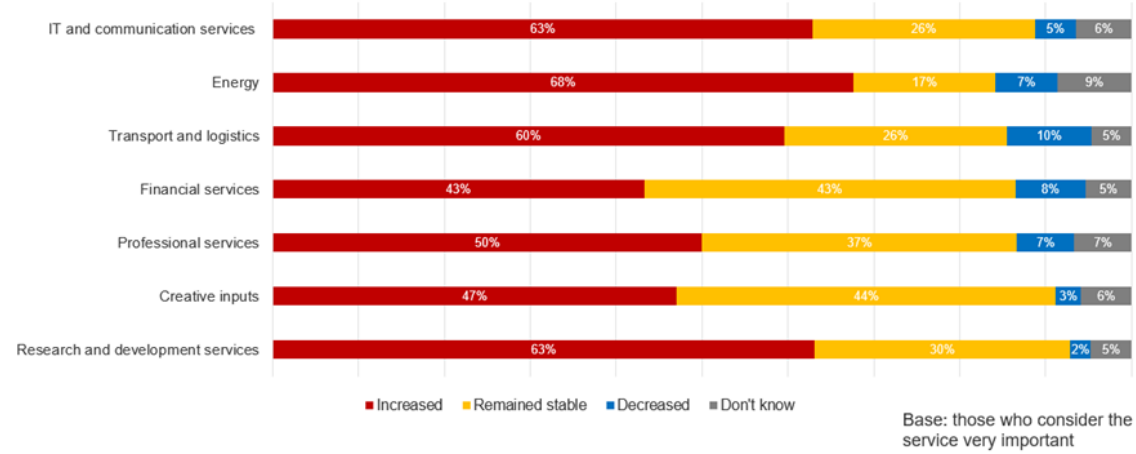
Figure 4.25: Change in level of competition in upstream goods markets, by aspect of competition



Source: Project Team

Moving to input markets for services, survey results displayed in Figure 4.26 suggest that competition in the upstream markets is perceived to have increased for all the services apart from financial services and creative inputs, where the opinions of respondents are similarly distributed between "Increased" and "Remained stable".

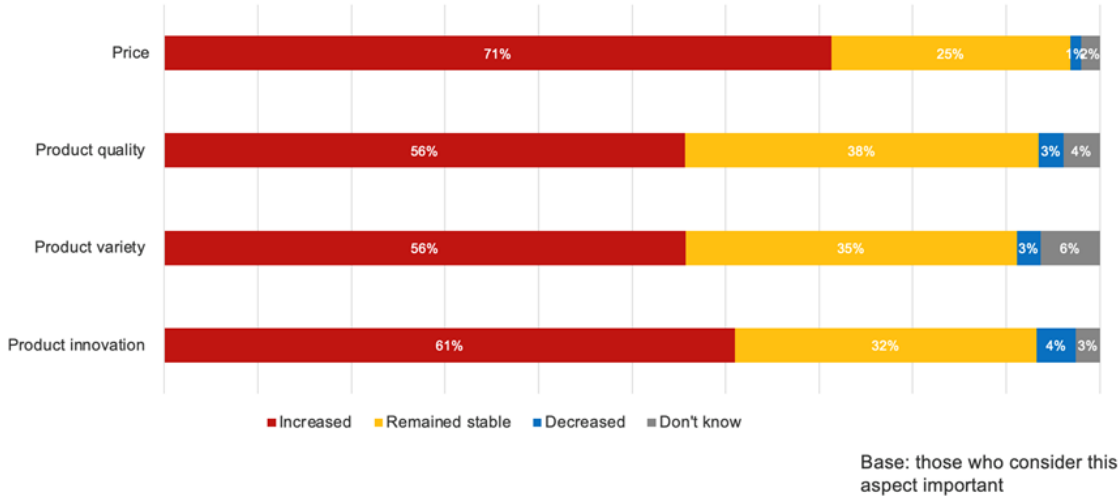
Figure 4.26: Change in level of competition among suppliers for services



Source: Project Team

Respondents consider competition in their domestic market increased as well. The highest change was observed in competition on prices, while in the other three aspects the variation was perceived by fewer firms (still the majority of respondents).

Figure 4.27: Change in level of competition in the domestic market, by aspect of competition



Source: Project Team

4.5 Conclusions

The objective of this chapter is to analyse the impact of competition in the domestic market on the export performance of firms in top export sectors. The literature reviewed in section 4.1.2 shows that competition in upstream input markets generally has a positive effect on export performance. Instead, there is less consensus on the impact of domestic competition in the market for the own product, since some scholars emphasize the positive effects in terms of incentives to innovate, enhance efficiency, and improve product quality, while others claim that competition may prevent firms to achieve a sufficient scale to be competitive in foreign markets.

In order to shed light on this debate, we administered a survey to a sample of exporting firms that are active in top export sectors, both at the national level and at the EU level. Three main findings emerge from the survey.

First, well-functioning input markets are a key element of an ecosystem that enhances the export performance of European firms. Indeed, competition in upstream markets, particularly for goods, is perceived as one of the main determinants of export success.

Secondly, domestic competition in the own product market is perceived to have a relevant and positive impact on export performance. Indeed, respondents claiming that it has a positive effect are three times as many as those that perceive a negative effect. This confirms the findings of Porter (1990) and following literature, according to which domestic competition incentivises firms to innovate and improve the quality of their products thereby becoming more competitive in the foreign markets. The channels identified in the literature are largely confirmed by the survey results, since a large share of respondents believes that competition incentivises them to improve quality, enhance efficiency, and innovate.

The survey also delivers interesting implications on the relationship between the impact of competition in the market for the own export product and market concentration. Firms operating in more concentrated markets (with fewer than three effective competitors) tend to attribute lower importance to the impact of domestic competition on their export performance. Instead, firms in less concentrated markets, which are the largest share of our sample, generally perceive domestic competition as a factor that affects their export performance (mostly in a positive way, as discussed above).

The third main finding that emerges from the survey is the importance of product quality as the key dimension of competition and of export success for our sample of firms. Indeed, quality is identified as the most important aspect of input products and services for export success, and as the main driver of success in the domestic market for the own product. Product quality is also perceived as the main dimension that is affected by domestic competition. This suggests that improved product quality is an outcome of the competitive process. Finally, the incentive to improve quality is perceived as the main channel through which domestic competition affects export success.

5 The cost of non-competition

As described in chapter 1, there is increasing evidence that the competitive environment has changed since the 1980, as documented by rising concentration, markups, and profitability in several advanced economies. There is intense debate on the drivers and the main features of these trends, ranging from the role of network effects in digital markets, to the role of technology more broadly and to too lenient enforcement of competition rules, but little doubt that reductions in the degree of competition have negative macroeconomic implications, including lower business dynamism, investments, productivity, and labour share. Building upon these notions, this chapter aims to systematically analyse the cost of reduced competition.

Specifically, section 5.1 focuses on the microeconomic estimation of market power, discussing the rationale behind the choice of measure of competition and reviewing a range of markup estimates from existing literature.

Once the degree of competition is properly measured, how can its benefits be assessed? Section 5.2 proposes counterfactual scenarios for the degree competition in the EU market based on the results from the previous section, together with evidence from the literature. These scenarios, in turn, are used as inputs for a macroeconomic model that allows to estimate the macroeconomic impact of changes in the competitive environment, in section 5.3. Finally, section 5.4 presents the results of these simulations. It summarizes the outcomes of different scenarios and contextualizes them with existing literature, leading to the study's conclusions. We should interpret the outcomes with the caveat the markup change that is simulated is fully linked with the limitation of market power, while it's true that the indicator might also reduce for other factors as efficiency gains or cost reduction.

The main results can be summarized as follows. Lowering the average markup, thus reducing firms' market power and improving the overall competition environment in the EU market, stands to significantly benefit overall growth. Effective competition will limit price increases, allowing more consumption among households and further investments from enterprises. As suggested by a study by European Commission (2023), EU competition policy interventions played a crucial role in limiting markup growth, thereby enhancing the overall economic performance. Nonetheless, recent studies have documented an overall acceleration in European markups since 2000. If this trend were reversed, GDP could increase by 5.5% and prices could decrease by more than 5.15% over a 20-year horizon.

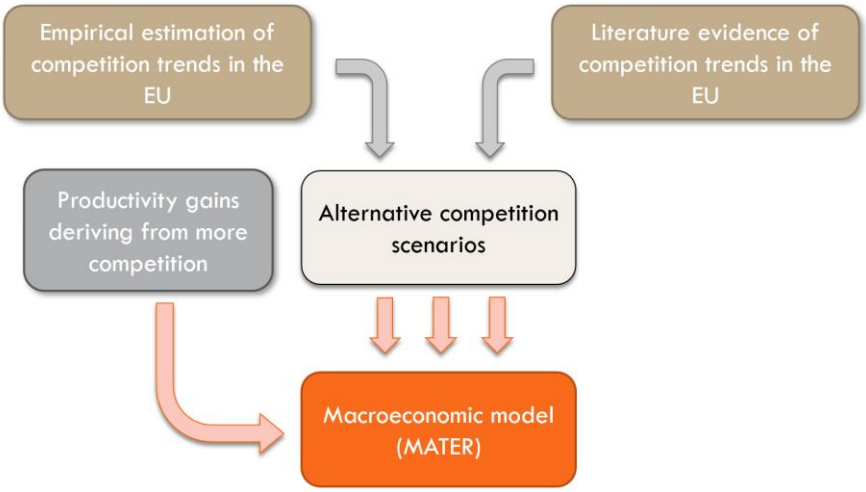
Estimating the effect of an alternative scenario for competition is not only a statistical exercise based on the past. The study also provides impacts for scenarios in which this loss, at least part of it in the short term, can be recuperated in the next future by acting today; allowing effective competition to limit the excess profitability of firms at the top 3% of the markup distribution in every sector (hence reducing their market power) will deliver in 5 years a gain of 2% in terms of GDP.

A slightly less positive outcome will appear under a different scenario, according to which a set of pro-competition reforms in Europe is assumed to reduce disparities in terms of competition among member states, allowing convergence of markups and thus fostering growth. When considering the outcome of this scenario, as in all others, we should keep in mind that in the simulations it is assumed that there is gradual implementation of structural changes to mimic the fact that some time is required for the implementation of competition-enhancing reforms and potential market entry of competitors. These results might be considering also indirect effects of competition, as suggested by parallel simulations that combine the effects of the competition shocks with the indirect support to growth that would appear by adding consistent shocks on

TFP. All the benefits will in fact be magnified (almost +2 p.p. in the case of the first scenario for GDP after 20 years), thanks to proven positive relation between competition and TFP.

The quantitative evaluation of the macroeconomic benefits of competition consists of several steps, which are schematized in Figure 5.1. The objective is to elaborate different benchmarking scenarios of the competitive environment, and to use them in a quantitative assessment of the benefits of competition in the EU27, relying on a structured macroeconomic framework to being able to analyse the channels through which changes in competition can affect the economy. The macroeconomic assessment of changes in competition are proxied by simulations of changes in markup based on the proprietary macroeconomic model MATER (Catalano, 2023). The MATER model is frequently applied for policy evaluations, encompassing both the real economy and the financial sector. Its versatility is demonstrated through its past applications in various domains, including short-term fiscal and monetary policy assessments (covering both conventional and unconventional measures), structural reforms analysis (modelled as lasting shocks to market structure), and in servicing private sector clients in the financial industry.

Figure 5.1: Methodological approach



Source: Project Team

The MATER model allows to assess the impact of competition changes compared to a baseline scenario that reflects the current state of the economy and the prevailing degree of competition.

The first step in the analysis is to estimate competition through markups and construct measures of markup shocks. There are two ways of doing so, and both will be used in the analysis to increase robustness of results:

- in the first approach, shocks to markups are based on existing estimates of markups from the literature. In other words, the approach takes literature results for markup evolution across regions and uses them to construct the benchmarking scenarios;
- in the second approach, firm-level markups will be estimated econometrically, and shocks applied to these estimated markups. More precisely, the approach relies on the Project Team's estimates of sectoral markups based on firm-level data to simulate alternative scenarios with more effective competition.

The second step will construct measures of Total Factor Productivity (TFP) shocks that are consistent with the simulated changes in the competition environment. Firm-level TFP will be retrieved by the same econometric estimation of firm-level markups ensuring

methodological consistency between the two measures. Then, aggregating firm-level markups within sectors, the elasticity of firm-level productivity to this aggregate[316] will be estimated, allowing to anchor a productivity shock to any given markup shock in the benchmarking scenarios[317].

The study will take into account that any competitive persistent shock is implemented gradually through time, with a phase-in which depends on the scenario considered. This approach reflects the fact that changes in the competition environment take time to be fully absorbed by an economy. This is true even for policy changes that impose exogenously a change in the level of markup. For example, adjusting pricing policies by firms may require technical lags with the respect to the supposed implementation of a policy. Moreover, policy changes often present a phase-in period to allow a gradual implementation by those affected by the new requirements.

Moreover, it is assumed that the TFP shock will be activated with a delay with respect to the markup shock, to reflect the fact that it takes time for the production sector to adjust the technology adopted or the production processes.

5.1 Microeconomic estimation of market power through markups

This section is structured in four parts. First, it discusses the rationale for selecting markups as the measure of competition in the current study. Second, it provides a review of the results from the empirical literature on markups employing firm-level data. The third part outlines the econometric approach to firm-level markup estimation. The concluding section provides an estimation of the elasticity of firm-level productivity to sectoral markups.

5.1.1 The rationale behind the choice of markup as a measure of competition

For the purposes of this workstream, the preferred measure of the degree of competition are markups, estimated for each sector using firm-level data. As discussed in section 1.2, markups, like any other measure of competition, have limitations, such as the fact that they can increase also due to increases in fixed costs, to changes in the nature of competition, and to increases in the market shares of the most efficient firms. Four considerations have led to the choice of markups despite their limitations: (i) the connection between markups and market power; (ii) the lower sensitivity of markups than other potential measures to the definition of the relevant market; (iii) the wider comparability with the extant literature; and (iv) project-specific considerations.

First, markups indicate market power. A firm with a markup larger than one enjoys some degree of market power, being able to charge a price above its marginal cost. As emphasized by the CMA (2022), markups larger than one do not necessarily imply the presence of excess profits, because in the presence of fixed costs high markups might only indicate that firms are recovering the cost of capital. However, even when there are large fixed costs, markups remain an appropriate indicator of market power,

[316] *The percentage change in productivity associated with a 1% increase in markups.*

[317] *Since the MATER model does not have an endogenous link between competition and TFP, the potential impact growth of changes in the degree of competition on economic needs to be considered separately. Hence, to assess the potential indirect effects of competition on economic growth, the model relies on a combination of markup and TFP shocks.*

signalling some limitation in the intensity of competition that is relevant to competition policy.[318]

Second, when compared to other potential measures of competition such as concentration measures, markups are less sensitive to the definition of the relevant market.

Third, as discussed in detail in the next subsection, a large body of literature has estimated markups. Previously used methodologies can be relied upon for both estimations and robustness checks. Equally important, this provides the opportunity of comparing results with those from a series of studies that have estimated markups.

Fourth, markup shocks are the input in the Prometeia-owned macroeconomic MATER model that is used to simulate the economy-wide impact of changes in the degree of competition.[319] Using markups as input to macroeconomic simulations further guarantees comparability with the QUEST model (Ratto et al. 2009), a macroeconomic model owned by DG ECFIN and used in collaboration with the Joint Research Centre to run assessments on the state of the EU economy.

5.1.2 Range of markup estimates from previous studies

Economic literature already looked extensively at markups and their evolution to assess the competitive environment, thus lending support to the approach adopted in this study. The results of the literature estimating markup changes over time in different geographical areas are heterogenous, with a considerably wide range of estimated values. To better contextualize the range of markups estimated and facilitate results comparability, consideration has been given to both the geographical scope and the temporal horizon of different studies.

There have been several studies that have analysed markup evolution in Europe since the 1980s. Some of these studies have already been discussed in section 1.3.2, which delved into theoretical discussions on competition: this section, instead, pivots towards empirical evidence, focusing particularly on studies that analyse markup evolution in Europe. This comprehensive and targeted review, concentrating on the specific levels of markups and their evolution, is intended to enable a thorough comparison between the findings of this study and those in the existing empirical literature.

Cavalleri et al. (2019), considering the four major European economies (Italy, France, Spain, and Germany) between 1978 and 2015, find that markups increased by 8%.[320] Bighelli et al. (2023) estimate a smaller increase in markups in Europe between 2009 to 2016 (+0.8%).[321] Weche and Wambach (2021) study markups for 28 EU countries in the period 2007-2015. They find that markups dropped sharply during the crisis years 2008 and 2009, and moderately increased afterwards. Overall, EU markups estimated by Weche and Wambach (2021) fell during their sample period. A different account is

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[318] *For instance, product differentiation might make competitors unable to expand into the firm's market segment; or consumers may face significant search costs, reducing their awareness of all alternatives (CMA, 2022).*

[319] *Indeed, the MATER model features imperfect competition at the retailers' level, generating a wedge between marginal costs of production and final prices. This wedge corresponds to the standard definition of markup.*

[320] *Similarly, CMA (2022) finds that firms' mean markup in the UK rose by 8% (from 1.2 to 1.3) over the last two decades.*

[321] *Monopolkommission (2022) consider German firms' data in a similar time frame as Bighelli et al. (2023), that is 2008-2017. They find that while markups in the manufacturing sector slightly increased by 1.8%, markups in the services sector decreased by 6%, with both changes mainly explained by changes within firms.*

provided by De Loecker and Eeckhout (2018). They use data on publicly traded firms from 1980 to 2016 and find that during this period markups in the EU experienced a 66.3% increase (from 0.98 to 1.63).

Comparing to these results for the EU, it should be noticed how for the United States, there seems to be more consistent evidence of a historical increase in markups, although the quantitative results still differ across studies. Konczal and Lusiani (2022) find an increase in markups from 1.26 to 1.72 (+36.5%) over a very long time horizon (1955 to 2021). Similar results, over a shorter time horizon, are reported by De Loecker et al. (2020), who estimate that aggregate markups in the US went from 21% above marginal costs in 1980 to 61% above marginal costs in 2016 (+33%). However, the change in US markups found by Traina et al. (2018) and by Eggertsson et al. (2021) is much less pronounced. The former report a markup increase from 1.10 to 1.15 (corresponding to a 4.54% change) between 1950 and 2016. The latter document an increase of 8.9% over the period 1970-2018.[322]

Several other studies provide results on markup changes across different country groups, in some cases both advanced economies and emerging markets. Here, too, there is significant heterogeneity in results. Akcigit et al. (2021) show how advanced economies experienced an increase in markups of 35% between 1980 and 2016, coherently with the evolution of markups they (as well as De Loecker et al., 2020) find specifically for the USA. In their database of over 60.000 firms (both publicly and privately traded firms) across 134 countries between 1980 and 2016, De Loecker and Eeckhout (2018) compute an increase in the global weighted mean of firm-level markups of 45.45%, compared to the 66% increase they estimate for the EU. Calligaris et al. (2018) report an increase in markups of about 8% over the period 2001-2014 based on their analysis of ORBIS data for 25 high-income economies. A similar result is found by IMF (2019), which estimates a 7.7% increase in global markups in advanced economies between 2000 and 2015. Diez et al. (2021) provide estimations of firm-level markup evolution in a sample of 19 advanced economies over 2000-2015. They find that average markups increased from 1.22 to 1.29 (5.7%).

While estimates from other studies are reported in Table 5.1, it is already apparent that the range of markup estimates in the extant literature is quite wide. The substantial variation in markup estimates across different studies is primarily a result of diverse methodologies and data sources used by researchers. Several papers employ distinct econometric techniques and theoretical frameworks that can lead to different interpretations of the underlying data and, hence, different conclusions regarding the magnitude of markup changes. For instance, some literature might use firm-level data while others might analyse industry-wide data, leading to disparities in the granularity of the results.

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[322] Traina (2018) and Karabarbounis and Neiman (2019) argue that the large increase in markups estimated for the United States by De Loecker et al. (2020) could be almost entirely driven by firms changing reporting expenditure from formerly COGS to selling, general & administrative costs (SG&A). Section B.7 in annex describes the approach adopted to check the robustness of markup estimations to alternative definitions of the flexible input in the production function.

Table 5.1: Summary of markup changes identified in the literature, by geographical area and other relevant dimensions

Paper	*Geographical area*	*Markup change range*	*Time horizon*	*Aggregation level*
Bighelli et al., 2023	15 European countries	Increased from 1.18 to 1.19 (+1 p.p.)	2009-2016	Firm-level
Cavalleri et al., 2019	Germany, France, Italy, and Spain	Fairly stable around 1.13-1.14 (+1 p.p.)	1980-2015 (macro estimates) 2006-2015 (micro estimates)	Sectoral and aggregate
Ciapanna et al., 2022	Italy	Up to 2.7 p.p. reduction after liberalization reforms	2008-2013	Aggregate
Weche and Wambach, 2021	EU28	Around 2.31 but unstable around economic crisis years	2007-2016	Firm-level
Forni et al. 2010	European countries	Reduced from 1.61 to 1.35 (-26 p.p.)	1996–2006	Service sector
Eggertsson et al., 2021	USA	Increased from 1.12 to 1.22 (+10 p.p.)	1970-2018	Aggregate
Gutierrez, 2018	USA	Increased from 1.15 to 1.21 (+6 p.p.)	1980-2014	Sectoral
Hall, 2018	USA	Increased from 1.12 to 1.27 (+15 p.p.)	1988-2015	Sectoral
De Loecker et al, 2020	USA	Increased from 1.18 to 1.67 (+49 p.p.)	1960-2014	Firm-level
Konczal and Lusiani, 2022	USA	Increased from 1.26 to 1.72 (+46 p.p.)	1955-2021	Aggregate and Industry
Nekarda and Ramey, 2020	USA	Increased from 0,97 to 1,07 (+10 p.p.)	1980-2013	Sectoral
Traina, 2018	USA	Increased from 1.10 to 1.15 (+5 p.p.)	1950-2016	Firm-level
Akgicit et al., 2021	Advanced economies, emerging markets	Increased by 35 p.p.	1980-2016	Aggregate
IMF, 2019	27 Advanced and Emerging economies	Increased from 1.28 to 1.36 (+8 p.p.). Advanced economies increased by 7.7%, emerging economies by 1.8%	2000-2015	Aggregate
Díez et al., 2021	20 countries (USA, Russia, Japan, Korea and an heterogenous selection of EU countries)	Increased from 1.22 to 1.29 (+7 p.p.)	2000-2015	Aggregate
Díez et al., 2018	74 countries	Increased from 1.11 to 1.58 in the US (+47 p.p.). Fairly stable in emerging economies around 1.38	2000-2015	Firm-level

De Loecker and Eeckhout, 2018	Global, Europe	Increased from 1.1 to 1.6 globally (+50 p.p.) and from 0.98 to 1.63 in Europe (+65 p.p.)	1980-2016	Firm-level
Christopoulou and Vermeulen, 2008	8 European countries and USA	No significant change in markup (with exception of Austria and a few sectors)	1981-2004	Sectoral
Calligaris et al., 2018	25 high-income countries (both EU, US, and others)	Increased from a log-markup of 0 to a log-markup of 0.8	2001-2014	Firm-level

Source: Project Team

The period covered by the different studies can also play a significant role. Economic conditions fluctuate over time due to various factors like technological advancements, regulatory changes, and shifts in consumer demand, which can all influence markups. Furthermore, geographic scope matters significantly; for example, the competitive dynamics in the European Union may differ from those in the United States due to, *inter alia*, differences in regulatory landscapes and in competition law enforcements efforts and priorities, which can affect markups.

In terms of aggregation, the heterogeneity in results can also stem from how data is pooled across countries, sectors, and time. Some studies might aggregate data at a high level, losing the nuances of sector-specific or country-specific trends, while others may maintain a disaggregated approach that better captures these subtleties but at the cost of broader generalizability.

To guide the analysis to the next section (where markups of firms from 23 EU countries over the period 2012-2019 are estimated and benchmarking scenarios are constructed based both on the results of the literature and on own markup estimates), the research was anchored around the works of IMF (2019), Diez et al. (2021), and Calligaris et al. (2018) for several reasons. First and foremost, the methods used in these studies align closely with our own approach. They use similar techniques to assess markups, which helps ensure that our comparisons and findings are reliable and credible. Furthermore, these studies focus on European nations, matching our geographic area of interest. This geographical alignment ensures that our findings are both relevant and contextual to the prevailing competitive dynamics within Europe. Lastly, in terms of temporal scope, these studies have focused on periods that closely match our research interval.[323]

5.1.3 Firm-level estimation of markups

Firm markups are not directly observable and require estimation (CMA, 2022). De Loecker and Warzynski (2012) provide a framework to estimate a firm's markup by comparing its production responsiveness to an input variation (output elasticity) against the costs incurred for that specific input. The intuition is that under perfect competition, the costs incurred by a firm on its production inputs and its capacity to modify its output levels are aligned. In such a scenario, cost-revenue shares[324] associated with these inputs are directly proportional to the output potential. Consequently, firms are not able

[323] *The focus in the selected literature on the period 2000-2015 serves as both an overlap and a precursor to our analysis spanning the years 2012-2019. This continuity provides timing relevance with respect to the objective of this study and allows a richer understanding of the evolution and trajectory of markup trends in recent decades.*

[324] *Cost-revenue shares are defined as the ratio between nominal expenses on a certain production input and the total nominal revenues of the firm.*

to price their products significantly above their marginal input costs, limiting their ability to extract excess profits. However, when this balance shifts, it indicates a misalignment between cost-revenue shares and production capabilities. In this case, companies are able to price their products in a way that brings in more revenues than their associated costs.

While the cost-revenue shares for production inputs can be easily retrieved from firms' balance sheets data, output elasticities need to be inferred. There are two approaches in the literature for estimating the output elasticity: the production function approach and the cost share approach (CMA, 2022). In the former, the output elasticity is econometrically estimated using standard balance-sheet data on firms, while in the latter it is determined as the share of the input in total expenditure. The main drawback of the cost share approach is that it relies on the assumption of constant returns to scale, as well as on assumptions on industry-level capital stock and user cost of capital which may not accurately reflect firms' capital stock and user cost of capital. The production function approach is used in this report because it is generally preferred in the literature, which also increases comparability of our results with those of existing studies.[325]

The starting point of the production function approach is to express output (usually measured as gross revenue or value added) as a function of inputs (usually, labour, intermediate inputs, and capital). A challenge in this estimation is the fact that firm productivity, which is correlated both with a firm's output and input choices, cannot be observed. Since this correlation leads to a bias in traditional econometric methods, an alternative approach has been developed in the literature (Heckman and Robb 1985) to correctly estimate production functions, called the "control function" approach. The main idea is to identify a proxy variable for unobserved productivity,[326] and to evaluate the production function in two steps. In the first step, semi-parametric methods[327] are used to estimate the coefficients of the variable inputs (inputs which are chosen by the firm after the realization of any productivity shock). In the second step, the coefficient on the capital input (so-called state variable, which is chosen by the firm before the realization of any productivity shock) can be identified with specific assumptions on the evolution of productivity.

This "control function" approach is not without problems. Two seem particularly relevant in this context. First, as argued by Bond et al. (2021) and De Ridder et al. (2022), if the analysis is based on revenue instead of produced quantity, results might misrepresent the true production patterns or not accurately reflect the real average markup. To address this issue to the best extent possible, the Project Team adopts the widely used approach of adjusting nominal variables in real terms using industry deflators. Output

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[325] Eggertsson et al. (2021) employ a different approach for the markup's estimation, deriving them from aggregate macroeconomic data. According to the authors, markups are proportional to the economy profit share of income, which is in turn derived from the data by taking the residual share of output, net of labour and capital income. However, this result depends on the assumption of constant returns to scale. There is also another branch of the literature that estimates markups using data on prices and quantities (demand approach). As noted in De Loecker and Scott (2022), this alternative method leads to markups which reflect both retailer/distributor and producer wedges.

[326] See Olley and Pakes (1996), Levinsohn and Petrin (2003), Ackerberg et al (2015) and Wooldridge (2009).

[327] Semiparametric models are statistical models that assume a specific form for the relationship between variables (parametric component), while also allowing for flexible adaptation to data patterns not captured by the specified functional form (non-parametric component).

and material costs are deflated using the producer price index, value added by a value-added implicit deflator, and the cost of employees by the wages and salaries deflator.[328]

Secondly, Raval (2019) highlighted that the markup results can vary depending on the choice of the variable input. Indeed, the choice of a "fully flexible" input, meaning one that can be easily adjusted or changed in the short term in response to variations in production levels or other conditions, is crucial in obtaining correct estimates. To address this, the Project Team compares markup results obtained using two different variable inputs with the objective of corroborating the findings. The first method designates materials as the fully flexible input, while the alternative methodology employs Cost of Goods Sold (COGS henceforth, which is the sum of materials and labour costs). The first approach, coherently with the recent benchmark literature (IMF 2019, Calligaris et al. 2018), addresses the issue that materials tend to be more flexible than other inputs such as labour, especially in the presence of labour market constraints typical of European countries, such as costs associated with employment terminations. The second approach is particularly valuable on two accounts. On one side, COGS serves as a comprehensive indicator that captures a wider spectrum of variable costs involved in production. On the other, it is useful to provide a reasonable benchmark for the results obtained under the first strategy.

The firm-level data used in this study are from ORBIS, a cross-country database available from Bureau van Dijk. ORBIS includes financial information (balance sheet, profit and loss account, financial ratios) recorded over time. Notoriously, it offers better coverage for large firms, and since the financial information primarily derives from company accounts, some cleaning is necessary before using the data (Bajgar et al., 2021).[329] This study covers approximately 117,000 firms from 23 European Union countries with non-missing balance sheet data between 2012 and 2019.[330] In terms of sectoral coverage, all industries are included, however, there is wide variation in coverage across countries due to the sampling strategy of the data provider.[331]

The firm-level production function, aligned with Diez et al. (2018), is expressed as a function of a firm's capital stock,[332] flexible inputs, and unobservable productivity levels. The Project Team estimates two versions of the production function. One in which both labour and materials are flexible inputs, but only materials are considered as the fully flexible input (meaning that the Project team is especially interested in how changes in material usage can influence the final output), and another in which COGS (materials and labour) constitutes flexible input. Both estimations rely on the Levinsohn and Petrin (2003) methodology, with real output as the outcome variable.

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[328] Data on deflators, at the country, two-digit NACE industry, and time level, are from Eurostat. As explained by De Loecker (2021) with reference to revenue data, deflating allows to eliminate common price trends, and in the specific case of homogenous products will convert revenue into effectively quantity data.

[329] Firms reporting turnover, sales, value added, cost of employees, tangible fixed capital, or depreciation and amortization below one are dropped from the sample. After deflating these variables, firms for which any of the deflated variable has any missing value are also dropped. This ensures to end up with a balanced panel in which each firm is observed in all years (2012-2019). For further details see Annex B.

[330] The twenty-three countries covered are: Austria, Belgium, Bulgaria, Czechia, Germany, Denmark, Spain, Finland, France, Croatia, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, the Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, and Slovakia.

[331] Germany (DE), Spain (ES), France (FR), Italy (IT), Poland (PL), Portugal (PT) and Romania (RO) account for 87% of firms in the sample.

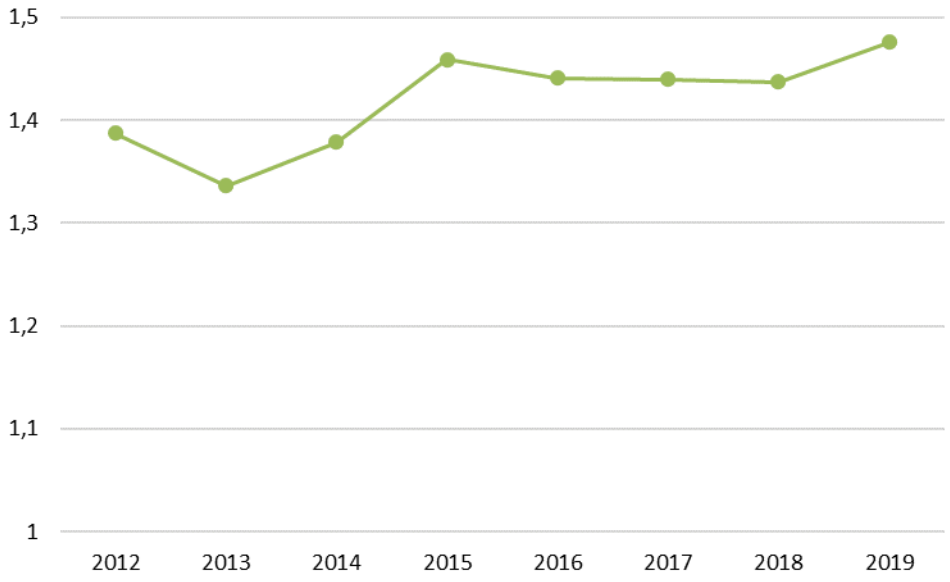
[332] Estimated at the firm-level using the standard Perpetual Inventory Method. For further details see Annex B.

As a result of estimating the production function using the control function approach, firm-level markups are retrieved, and firm-level values of productivity are obtained as residuals. This allows to proceed to the next step, which consists of estimating the relationship between productivity and (industry-level) markups. Before proceeding with the estimation of the relationship, the remainder of this subsection provides descriptive analysis of, and some sensitivity tests on, the estimated markups.

5.1.3.1 Descriptive analysis of estimated markups

In this section, the results for the markup estimation using materials as the fully flexible input are presented. The same figures for the markups estimated using COGS as the fully flexible input are reported in Annex E.4. Figure 5.2 represents the evolution of turnover weighted markups for EU firms between 2012 and 2019.

Figure 5.2: EU turnover weighted markup evolution



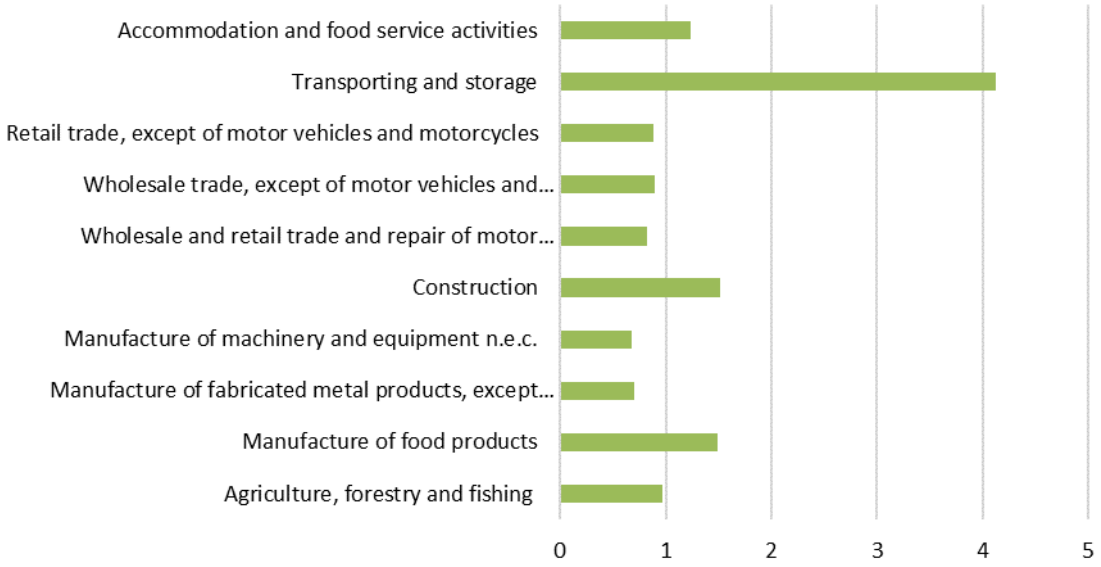
Project Team based on ORBIS and Eurostat data

The average of the markup at the EU level shows a variation of 6.4% between 2012 and 2019, with an average level of 1.42. This growing trend confirms the findings of the three most representative studies introduced in section 5.1.2, which measure an average annual markup growth of 0.5%[333] compared to 0.8% of this analysis.

The results can be further broken down into geographical and sectoral components, thanks to the micro-level analysis undertaken. Looking at the ten sectors represented in Figure 5.3 (see Annex E.2 for the sectoral aggregation), which cover 62% of the firms in the ORBIS database, it is immediately apparent that there exists non-negligible heterogeneity. The "Transportation and storage" industry displays a considerable level of markup across the EU in 2019. "Construction and manufacturing of food products" is the next highest markup sectors, with values above the average. On the other hand, markups below the average are estimated for the sectors retail trade, manufacture of machinery, and manufacture of fabricated metal products.

[333] *The average annual growth is calculated as the cumulated growth rate divided by the number of years in the period of analysis. The number reported is the average of the three benchmark studies considered.*

Figure 5.3: EU turnover weighted markup evolution



Source: Project Team based on ORBIS and Eurostat data

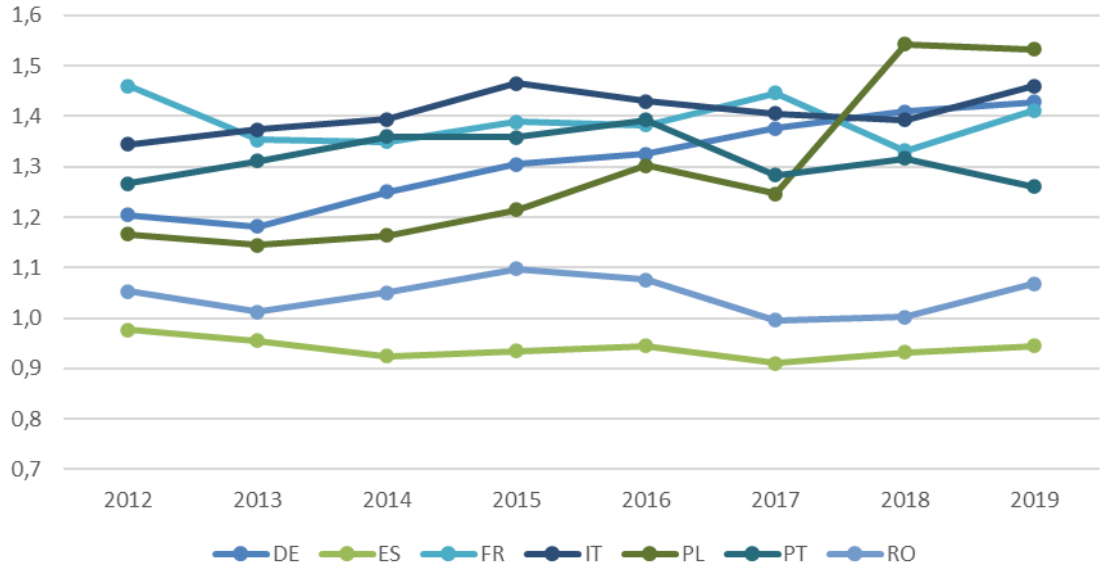
By disentangling the markup by EU member country, it is possible to discern how the evolution of markups followed different paths across different countries between 2012 and 2019. Figure 5.4 illustrates the evolution of turnover weighted markups for seven countries representing 87% of the firms in the sample.[334] It is important to highlight that the heterogeneity in terms of sectoral composition between countries limits the comparability of the reported figures.[335] With this caveat in mind, Figure 5.4 shows that while Spain was mostly stable and very low across the period (closing in 2019 at 0.94), Poland underwent a growing trend (from 1.17 in 2012 to 1.53 in 2019), as well as Germany (up 0.2 points). France on the other hand presents a contraction of weighted markup level, down from 1.46 to 1.41. Italy and Portugal peaked in 2015 and 2016 respectively, and then the former closed 0.12 points higher than 2012 at 1.46 while the latter came back to the starting value. The country markup dynamics appear to be in line with the evolution of the PMR (Product Market Regulation) indicator, calculated by the OECD for the same EU countries.[336]

[334] *Within the context of firm's representativeness in the sample, the case of Romania's Mining and Quarrying (NACE sector B) stands out as one of extreme heterogeneity. To preserve the coherence of the sectoral analysis, outlier firms have been selectively excluded from the sample. This methodological omission is premised on maintaining statistical robustness within the broader sectoral markup evaluation.*

[335] *Also, other studies have attempted at quantifying markups at country level (Diez 2021), but full comparability is prevented by the time-horizon and geographical scope of this analysis. As a reference, in Diez (2021), the top 3 European countries for markups in 2015 are Portugal, Greece and France; the bottom 3 are Austria, Belgium, Netherlands.*

[336] *The correlation between country markups variation over the period 2012-2019 and country PMR Total Network Sectors (the only industry aggregation for which OECD provides methodologically consistent time series) is overall positive (0.35). This means that a higher markup level (lower competition) is associated with a higher PMR indicator (more regulatory barriers).*

Figure 5.4: Turnover weighted country markup evolution



Source: Project Team based on ORBIS and Eurostat data

5.1.3.2 Correlation with profitability and other checks

Increases in firm-level markups may also reflect the need for firms to recoup fixed costs of investments and/or a shift towards forms of competition based more on quality and differentiation, and less on price, therefore not necessarily manifesting a rise in market power and associated profits.

To rule out these possibilities and strengthen the interpretation of the estimated markups as reliable measures of market power, correlations between markups and measures of profitability are measured, specifically the EBIT margins (the ratio of EBIT to operating revenues – a commonly used measure of profitability, see for instance CMA, 2022). This profitability measure takes into account not just the immediate costs of producing goods or services, but also total expenditures, including fixed costs and capital expenses. If both the markups and profitability are rising together, it strengthens the case that a firm's market power is increasing. Our analysis has shown a positive relationship between markups and EBIT margins.[337] Reassuringly, these results are qualitatively in line with the results of Diez et al. (2018), De Loecker et al. (2020), or De Ridder et al. (2022), who also report that firms with higher markup estimates are more profitable.

Other potential issues relate to the fact that multinational firms may enjoy market power in foreign markets, and to the possible impact of tax optimization strategies on markups.[338] Indeed, financial figures of companies with subsidiaries in foreign markets may misrepresent the actual revenue composition and thus the estimated markups, due

[337] *The regression analysis between firm-level markup and profitability is useful to identify the link between the two variables considering firm and year effects. It is important to note that this specification has not the objective of establishing causal relationship between profitability and markups. The message taken from this analysis is that highly profitable firms also display higher markups. The results of the estimations are reported in Table B.1 of Annex B.*

[338] *Sorbe and Johansson (2017) show that markups are systematically higher for firms belonging to corporate groups that have the potential to engage in international tax planning.*

to intra-company transfers and tax-optimization strategies. To address these issues with the data at hand, estimations of markups have been conducted on a subsample of firms whose Global Ultimate Owner (GUO) is in the same country as the country in which the firm is registered. The results[339] indicate that the distribution of estimated markups and the elasticity of productivity to aggregate markups are similar to the ones estimated in the full sample. This ameliorates the concern that markups may systematically correlate with the multinational status of the firm.

5.1.4 Markup impact on productivity

As discussed in section 1.1, numerous studies have indicated a correlation between competition and productivity at the firm level. Our research further explores this notion by quantifying the extent to which productivity responds to fluctuations in the degree of competition, as measured by changes in markups. This helps the broader assessment of the economic advantages derived from more effective competition. Consistently with prevailing academic perspectives,[340] the Project Team posits that competition acts as a driving force behind enhanced productivity.

Competition fundamentally dictates the dynamics of interactions among firms in a given market. To accurately gauge this, productivity has been computed at the sector level, aggregating firms within the same industry by year and country.[341] Similar to Rodríguez-Castelán et al. (2020), the productivity level of a specific firm in a given year was estimated through regression analysis. More specifically, productivity was regressed against the estimated degree of competition at the country-sector level of the firm. Fixed effects were also included in the regression to control for unobserved, systematic differences across countries, sectors, and years. The degree of competition is proxied by the logarithm of the markup and aggregated by country, sector, and year, weighted using firm-level turnover. This approach allows to determine the relationship between a firm's productivity and the prevalent markups in its sector.

Reverse causality may arise between markup and productivity: while higher markups might influence productivity, the productivity of a firm can also shape the competitive environment in its sector. This interplay becomes clearer when analysing the link between a firm's markup and its productivity. Specifically, a highly productive firm might command higher prices for a given cost structure, suggesting that enhanced productivity could lead to elevated markups (Altomonte et al. 2018). However, by focusing on sector-wide markups, this concern is mitigated, since the productivity of a single firm would likely have only a marginal impact on a markup measure that spans an entire country's sector.

Although several studies have investigated the link between markup and productivity, finding a negative effect, it is not straightforward to extrapolate an elasticity from the literature, because existing studies are quite heterogeneous in terms of geography, timespan, level of aggregation considered, methodology, and results. Some studies such as Carvalho (2018) are single country, while others such as Weyerstrass et al. (2006)

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[339] Results for aggregated EU markups are reported in Annex B (Figure B.4)

[340] Another branch of the literature supports the opposite idea, claiming that more concentrated markets also display stronger productivity growth. Based on US economic census data in the period 1982-2012, Autor et al. (2020) find evidence in support of the positive relationship between market power and labour productivity. Using CompNet data, Beghelli et al. (2022) also show that changes in concentration are positively associated with changes in productivity, but statistically unrelated to markup variations.

[341] Specifically, productivity is estimated as the residual of the production function at the sector level.

or Ospina and Schiffbauer (2010) use data that are two decades old (up to 2004 for both studies). In a more recent study focusing on the EU-20 as an aggregate for the period 2002-2014, Siedschlag et al. (2020) estimate how labour productivity is affected by the level of competition using the HHI as indicator, rather than markups. Breda et al. (2019) also consider the relationship between TFP and the HHI in the United States over the period 2000-2016. Ganglmair et al. (2020), while also focused on a single country (Germany), is perhaps the closest study to ours. They estimate the elasticity of firm-level productivity (both labour productivity and TFP) to markups. However, they consider firm-level rather than aggregate sector-level markups. In their most conservative estimations, they find that a 1% increase in markups is associated with 0.2% reduction in TFP.

Based on the markups calculated in section 5.1.3 using materials as flexible inputs, a TFP-to-markup elasticity of -0.13 is estimated (see columns (1)-(2) of Table E.3). This elasticity (how much TFP changes in response to the change in markup) is obtained in regressions using the markups estimated using materials as fully flexible inputs, aggregated across firms withing country, sector, and time.[342]

This finding is significant not only as an input for our macroeconomic modeling in the MATER simulations but also as a standalone result with substantial economic implications. The negative elasticity suggests that an increase in market power, as indicated by higher markups, is associated with a decrease in TFP. This could imply that as the competitive pressure weakens, the efficiency in the use of inputs (like labour and capital) diminishes.

5.2 Benchmarking scenarios

Once markups have been calculated at sector and country level, together with results retrieved from the literature, they contribute to the definition of alternative scenarios of the degree of competition, whose effects will be assessed by the MATER model. The economic logic behind this simulation is to measure the potential macroeconomic benefits stemming from (hypothetical) policy actions directed at improving the European competitive environment. The definition of these alternative scenarios relies on two different approaches. In the first approach, results from the literature are used to construct a counterfactual competition scenario. In the second approach, alternative values of markups are built leveraging on those estimated in section 5.1.3. This allows a counterfactual simulation of markups and their transmission to the economy also at the sectoral and country level.

In both cases, the markup shock takes place gradually over a phase-in period which depends on the scenario considered. The rationale behind this modelling choice is that historically changes in competition took place at a gradual pace, even if driven by policy changes. Moreover, in the context of the MATER model, it takes time for the real economy and for prices to fully incorporate the effects of the markup shock.[343] Hence,

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[342] *Columns (3)-(4) of Table E.3 provide results of the estimation of the TFP-to-markup elasticity using COGS-based markups. In the most conservative estimation with country-year and sector-year fixed effects, the estimated elasticity is almost equal to the elasticity estimated with materials-based markups.*

[343] *This is because the economy in the MATER model reacts gradually to shocks. The MATER model indeed presents a set of nominal and real frictions (e.g., price and wage rigidities, employment adjustment costs, investment adjustment costs), which will be included in the model to replicate the empirical evidence on the dynamic of macroeconomic variables after shock perturbations. As a result, when the economy is hit by the markup shock in the scenario simulations it reacts with a delay and the full effects of the shock appear gradually.*

the aim of the simulations' structure was to mimic as much as possible the dynamic of the shock itself as we would expect in the real world.

For the sake of clarity, Table 5.2 presents a summary of the three simulations. The rest of this section further explores the technical details of the scenarios.

Table 5.2: Summary of alternative scenarios

Approach	*Scenario*	*Scenario description*	*Shock size*	*New markup*
Counterfactual markup shocks based on the literature	Historical scenario	This scenario models the impact of restoring competition to levels seen in year 2000.	7.54%	1.157
Counterfactual markup shocks based on estimated markups	Counterfactual markup shock based on empirical distribution	Firms displaying the highest market power in their sectors undergo a reduction of their markup level. This scenario models the effects of reducing excessive pricing power in dominant firms.	-8.45%	1.059
	Counterfactual markup shock based on country convergence	Countries with aggregate markup levels above the EU average reduce their markup by 1/3 of that difference. This scenario assesses the impact of decreasing competition disparity across EU nations.	-8.38%	1.06

Source: Project Team

5.2.1 Approach 1: Counterfactual markup shocks based on the literature

Approach 1 utilizes established markups and their changes as derived from the literature. This method involves setting the current level of markups based on the calibration of the Lerner index, as reported in the European Commission (2023), which is established at 1.157.[344] This value reflects the current average extent to which prices are marked up above costs. Additionally, the approach includes an observed increase in markups equal to 7.54%, sourced from the preferred literature.[345]

5.2.1.1 Scenario 1: Historical scenario

Scenario 1 is labelled Historical because it simulates a shock in the past. The main idea is to simulate a counterfactual evolution of the EU economy in absence of the observed increase in markup, with all other factors remaining constant. Given a markup increase of 7.54% between 2000 and 2015[346] and a current markup level of 1.157, the initial

[344] *European Commission (2023) calibrates the initial Lerner index (defined a (p-mc)/mc, where p = price and mc = marginal cost) at 13.56%. Using the formula L = 1 – (1/markup), where L is the Lerner index and markup is p/mc, the markup corresponding to a Lerner index of 0.1356 is 1.157. The Project Team adopted this initial level of markup for the approach 1 simulations to enhance the level of comparability of the results with those of European Commission (2023), obtained through QUEST model simulations.*

[345] *According to IMF (2019), there is an estimated 7.7% increase in markups between 2000 and 2015. Diez et al. (2021) report a 5.7% increase between 2000 and 2015. Calligaris et al. (2018) indicate an 8% increase between 2001 and 2014. The overall average over 15 years derived from these individual estimates, is 7.54%. This number is calculated as the annual average of the three reference studies multiplied by 15.*

[346] *As suggested by European Commission (2023), this historical increase may have been even larger if not for the enforcement activity of the European Commission. At the same time, this scenario fails to fully capture the expenses associated with non-competition, as it only considers the rise in markups from 2000 to 2015. If we were to extend the average growth rate in markups observed during this period to a span of 20 years, the impact would be more substantial.*

markup value is set at 1.08. The simulation steps for this Scenario are (i) shock the economy with a positive markup shock leading to the 1.157 level; (ii) invert the sign of the impacts to obtain the "cost-of-non-competition" hypothetically paid by the EU economy for the historical increase in markup.[347] Results from the Historical scenario can be interpreted as an estimation of the cost associated with the past increase in competition. This scenario serves as a hypothetical counterfactual, based on the assumption that all other variables remain constant, except for the variable of interest.

The Historical simulation does not consider all the elements that changed over the 2000-2015 period in EU on top of markup. Hence, the results we obtain from this type of simulations are a proxy of what would have been the European economy in the absence of the markup increase that took place. For this scenario a phase-in period of 10 years is adopted. This is because the empirical evidence shows that most of the historical variation in markup in Europe after 2000 took place actually in a ten years horizon.[348]

5.2.2 Approach 2: Counterfactual markup shocks based on estimated markups

Approach 2 uses markups estimated in section 5.1.3 to construct alternative scenarios based on counterfactual reasoning. The economic logic is to simulate hypothetical future dynamics and new equilibrium for the EU economy, with more effective competition. This type of exercise is useful to assess the potential gains of lower markups and evaluate the potential impacts of policy changes or simply changes in the competition level. Results from the Future scenarios can be interpreted as simulations, everything else equal, of what could be the impact of a future changes in markup in the EU. For the future-looking scenarios a phase-in period of 5 years is adopted. This is because five years is a reasonable time for the implementation of both spontaneous and policy driven changes in the level of competition.

5.2.2.1 Scenario 2: Counterfactual markup shock based on empirical distribution

This scenario simulates the benefits of competition stemming from a limitation of market power for already dominant firms in their markets. The simulation is constructed by confronting the empirical distribution of markups estimated in section 5.1.3 with a counterfactual distribution in which all markups above the 97th percentile are winsorized.[349] The percentage difference between the average markup in the actual distribution and the average markup in the winsorized distribution (based on materials markups) is equal to -8.45%. The current markup level of EU follows again the calibration of the Lerner index in European Commission (2023) and is set at 1.157. In this scenario, then, the markup decreases by 8.45% to 1.059.

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[347] The MATER model presents a certain degree of asymmetry in the adjustment costs of wages and employment, namely the cost of adjusting upwards hourly salary or employment is lower than the same adjustment downwards. This modelling choice has been made to have a better match, in terms of labour market dynamics, with the data. As a consequence, the impact of positive and negative shocks might differ for some variables, even though the shock size is the same. A set of robustness checks performed by the Project Team have shown that the asymmetry in the effect of positive and negative shocks is limited. Hence, keeping in mind that this simulation exercise might contain a degree of imprecision, not present in the other simulations, it is possible to interpret the results of a positive markup shock, as if it was a negative shock, inverting the sign of the outcomes.

[348] An additional simulation adopting a hypothetical future rationale ("what would happen if today's markups decreased?"), in which the market power increase is "undone" today (2022 as base year) by reducing markup of 1.157 to the initial level of 1.08, is presented in annex E.7.

[349] Winsorization is a statistical technique that involves capping the extreme values of a variable, essentially transforming outliers into less extreme values. In the study, the procedure imputes the value of the 97th percentile of markup distribution to all the observations above that threshold.

5.2.2.2 Scenario 3: Counterfactual markup shock based on country convergence

This scenario is constructed following the spirit of Pfeiffer et al. (2023), allowing for partial convergence in markups across European countries. The economic logic behind it is strengthening a country's competitive environment through economic reforms aimed at promoting competition. Under this scenario, the country-level markups of countries with markup higher than the EU average (computed as country-level turnover-weighted averages of materials-based markups estimated in section 5.1.3) is reduced to 1.06. The starting markup level is set again at 1.157 (European Commission 2023), leading to an aggregate reduction of markups by 8.38%. Like scenario 2, this is a future scenario, and therefore it is assumed that the economy is hit by the markup shock in 2022 as base year.

5.3 Macroeconomic impact

Under the assumptions of the alternative scenarios described in section 5.2 markup shocks are applied in a general equilibrium model the MATER model[350] in order to assess the macroeconomic implication of the scenarios. To enhance comparability with previous studies conducted by DG Comp (2021), the analysis focuses on the EU27 countries, considering the aggregate level of competition and macroeconomic outcomes.

While the microeconomic analysis was conducted on a sample of 23 EU countries, the macroeconomic analysis encompasses EU27 member states. This distinction arises because the financial statements utilized for estimating markups are derived from 23 countries, due to availability of firm-level data. However, the macroeconomic model extrapolates the markups derived from firm-level data of 23 countries, treating these countries as representative of the entire EU27, and extending these micro-founded results to fit the broader context of the European Union.

With further elaborations, the markup shocks are also associated with TFP shocks, estimated using the empirical relationship between productivity and markups (section 5.1) in the data. The combination of the two shocks aims to capture all possible direct and indirect effects of competition on business dynamism, productive efficiency, and dynamic efficiency. We assumed that the phase-in of the TFP shocks is always aligned with the one of the markup shocks.

In the next sections, the model and its underlying mechanisms are described. Then, the results are presented, quantifying the impact of competition on economy-wide measures of performance and welfare such as GDP, employment, prices, investments, and productivity. Impact of markup shocks only and of combined markup and TFP shocks are provided separately.

5.3.1 MATER structure description

The MATER framework is a multi-country, general equilibrium model, designed for macroeconomic scenario analysis. The framework is a network of two large-scale models, an Overlapping generation Model (OLG) and a Dynamic Stochastic General Equilibrium Model (DSGE), integrated in a top-down procedure.

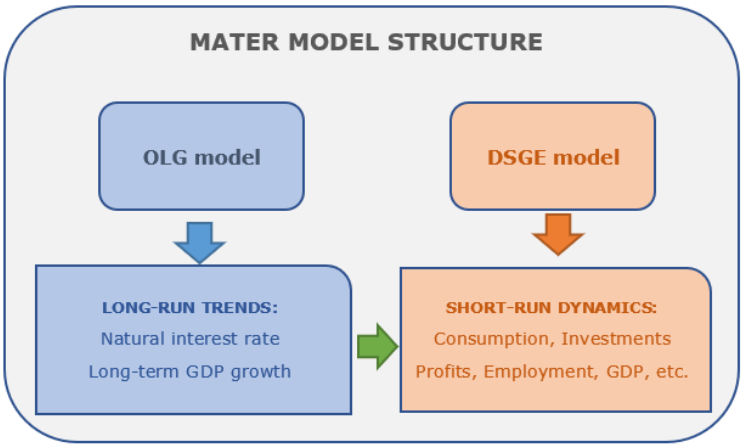
The OLG and DSGE models are complementary in that the OLG model deals with long-term intertemporal behaviour (consumption, labour, and investment), while the DSGE model addresses short and medium-term intertemporal choices by explaining the deviations of actual levels from potential ones defined in the former. The MATER model relies on rigorous microeconomic foundations derived from utility and profit optimisation

[350] *Details on the structure of the MATER model and on simulation results are provided in Annex C.*

and includes frictions in goods, labour, and financial markets as well as market imperfections. The factors disrupting the equilibrium from natural levels can be policy shocks and supply and demand shocks, in line with the standard New Keynesian DSGE literature. Hence, MATER's structure allows for a comprehensive analysis of both short-term fluctuations and long-term trends of the economy.

A schematic representation of the structure of MATER is in Figure 5.5 The remainder of this subsection provides a description of how changes in competition are modelled in MATER.

Figure 5.5: Schematic representation of the structure of MATER



Source: Project Team

5.3.1.1 Modelling competition in MATER model

The DSGE model features multiple sectors, including households, firms, financial intermediaries, government, and the central bank. It also considers real and financial frictions, such as sticky wages and prices. The firms' sector, which produces services and goods, is organized into several sub-sectors: capital aggregator sector (which aggregates domestic and foreign capital investment goods), capital retailers (which purchase capital investment goods from the capital aggregator and sell capital services to government and entrepreneurs), entrepreneurs (who own the firms and benefit from dividends and profits), wholesalers (which produce intermediate goods) operating in a perfect competition regime, and retailers (which produce multiple final goods) that operate in a monopolistic competition regime. Hence, in the final (retailers') sector, competition is directly measured by the level of markup, defined as the inverse elasticity of substitution between the final goods varieties. This markup reflects how readily consumers switch between different product varieties; thus a higher markup suggests that products are less substitutable, indicating greater market power for firms. This feature of the MATER model marks a difference with respect to the version of the QUEST model used by European Commission (2022), where the markup arises in the

intermediate sector.[351] Pfeiffer et al. (2023)[352] instead use a version of the QUEST model with imperfect competition and therefore observes markups also in the final sector, as in the MATER model.

The firms that operate in monopolistic competition and that exhibit a markup are the final goods sector producers which face domestic and foreign consumption and investment demand (i.e., durable, and non-durable consumption goods, dwelling investments, domestic capital investments, and exports). In this context, the final prices are set by multiplying the markup with the marginal costs, and then dividing by TFP. In simpler terms, prices increase with a rise in the markup or marginal costs and decrease with an increase in TFP. It is worth noticing that in the MATER model the production technology faced by the retailer sector is the same with respect to the wholesaler sector, with only the wedge imposed post-production by retailers' market power. Hence, it is possible to say that our approach is not in conflict with the discussion in the literature opened by the De Looker on estimating markups by combing production and demand data.[353]

In the MATER framework, an escalation in competition, implying a decreased markup, corresponds to reduced final prices. It is worth noting that the degree of competition in a market may change for a variety of reasons, including changes in competition policy. However, the MATER model is agnostic as to the cause of the change in the degree of competition (e.g., markup shocks). Instead, it focuses on quantifying the effects of these changes, regardless of their underlying drivers.

Similarly, a surge in TFP will cause a decline in prices, all other things being equal. As in the QUEST macro-model, the MATER model does not feature explicitly a theoretical link between competition and TFP. Both models lack an endogenous R&D sector which can react to the changes in markup levels. Indeed, technological progress in the MATER model is exogenous. Moreover, firms' entry and exit are not modelled explicitly, leading to an exogenous distribution of operating firms in the market.

For these reasons, and to account for the potentially relevant effects on both allocative (optimal resource distribution) and dynamic efficiency (how quickly an economy innovates and adapts over time), a reduced form approach has been adopted. This approach allows to capture the effects of changes in markup on relevant outcomes, streamlining the analysis while maintaining a balance between complexity and insight.

5.3.1.2 Simulating alternative scenarios with markup and TFP shocks

For the counterfactual evaluation exercises, the alternative scenarios are compared to the initial steady state, as done by European Commission (2023), to quantify the benefits of competition. The main assumption of this type of counterfactual simulation

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[351] Similarly to MATER, Eggertsson et al. (2021) also assume monopolistic competition at the final goods (retailer) level. The implication of having imperfect competition at the final goods sector is that a change in markup is directly transmitted to the consumers without the intermediate step that is present when imperfect competition is at the wholesale sector, as in QUEST used by European Commission (2023). In absence of frictions between wholesaler and retailer sector, the transmission of the effect of a markup shock to the economy should not be affected. Differences in results might appear if there are differences in demand elasticities among sectors, but since in the current analysis an aggregate shock to all sectors is assumed, the difference in elasticities should not be a concern.

[352] Pfeiffer P., Varga J. and in 't Veld J., "Unleashing Potential: Model-Based Reform Benchmarking for EU Member States", July 2023, DISCUSSION PAPER 192, European Commission, Directorate-General for Economic and Financial Affairs

[353] See https://www.comp-net.org/fileadmin/_compnet/user_upload/Keynote_De_Loecker.pdf for more details.

exercise is that the elements that drive the economy away from its initial steady state are both markup and the resulting TFP shock. The level of markup in each alternative scenario is calibrated according to the scenario definition strategy specified in section5.2. The computation of the markup shocks is a crucial step for the simulation phase. This approach follows the most recent literature on the estimation of the impact of structural changes using so-called general equilibrium models.[354] Indeed, these models are well suited to highlight the intricate relationships among agents and sectors, mirroring consumer behaviours and technological trends to capture shifts in economic fundamentals.

In the cases in which it is applied, the TFP shock is modelled as an exogenous permanent shock to the level of productivity, that aims at replicating the effects on the economy of improvements in productive, allocative, and dynamic efficiency triggered by a change in markup, as described by the existing theoretical literature.[355] As mentioned before, the shock takes place gradually, and its effects on the real economy and on prices takes time to appear, also due to the various frictions present in the model. The dynamics of the simulated effects are therefore realistic, considering gradual and persistent change in the level of competition that took place historically.

5.3.2 MATER channels activated by a markup shock

To guide the interpretation of the results in the next section, Box 5.1 describes how a shock in markup affects the overall economy within the framework of the MATER model, detailing the different channels thorough which a reduction of markup will impact several macroeconomic variables.

[354] *See for example European Commission (2022) and Pfeiffer et al. (2023).*

[355] *See section 1.1.1 for a discussion of the productive, allocative, and dynamic efficiency of competition.*

Box 5.1: A review of the literature on the effects of legal cartels

Markup reduction boosts aggregate demand and employment.

A synthetic description of the chain of impacts after the shock is as follows. The reduction in prices after the markup shock, everything else equal, stimulates aggregate demand, leading to higher consumption. At the same time, the increased demand for final goods by households helps to reduce the negative impact on firms' profits and sustains employment. The impact of the deflation is translated also on input prices, namely real wages and return on investments. Both prices increase due to the higher demand of labour and investments, leading to a general increase in households' labour income and in capital returns for those households who are capital owners. On the other hand, households who are net borrowers are worse off since the cost of borrowing is now higher for them. Finally, investments are stimulated in the long run by the fact that households benefit from a general increase in disposable income and consequently supply more investment capital to the economy.

When activated, the TFP shock magnifies the effects described above, also activating the additional channel of productivity improvement. Indeed, with a higher level of productivity due to the positive TFP shock, firms can now produce at lower marginal costs, having more resources for investments, employment, and wages.

More detailed description of the channels at play in the model can be found in Annex E.

Source: Project Team

5.4 Results

The MATER model is calibrated according to an initial level of markup for the EU27 of 1.157, corresponding to the 13.56% in terms of Lerner Index adopted by European Commission (2023). This is the initial level of markup that is considered for the alternative scenario simulations, with the exception of the Historical scenario, which has an initial steady state level of markup equal to 1.08, as it was estimated for the year 2000. All the simulation exercises follow the assumption that the economy is hit by the markup shock while being in the steady state. The choice of having the European Commission (2023) level of markup was driven mainly by a comparability motive with the macroeconomic simulations performed by European Commission (2023) with the QUEST model, which was the benchmark model for the current study.

5.4.1 Scenario 1 results: Counterfactual markup shocks based on the literature

The *Literature-Based Historical* scenario aims at evaluating what would be the benefit of *undoing* the 7.54% markup increase that was empirically estimated by selected papers in the literature starting from the year 2000. To do so, an increase in markup from the steady state of 2000 is simulated, inverting the sign of the outcomes, and interpreting them as the potential gains. A simulation is performed in which the markup has an initial value of 1.08 and is subjected to a shock increase of 7.54%, resulting in a level of 1.157, with a phase-in period of 10 years.

Table 5.3 shows that the decrease in the markup would trigger an increase in real GDP by 1.22% after five years, and by 3.25% after ten years, when the full size of the markup shock starts to be implemented. The increase in competition triggers deflationary pressures which bring a decrease in inflation as measured by the GDP deflator change equal to -1.95% after five years. The simulation indicates that all the primary components of aggregate demand would rise. More precisely, after five years,

a substantial increase in consumption (+1.26%) would be observed thanks to the positive impact of reduced prices on household disposable income, stimulating demand, and investments (+1.35%), with a decrease in profits associated with the negative markup shock equal to -4.12%. Also, labour productivity would be positively affected by the markup shock, with a 0.30% increase after five years. This effect on labour productivity is due to the fact that the labour market frictions that slow down the adjustment in employment, with respect to the adjustment in GDP. Indeed, after the markup shock, the economy will be able to produce a larger amount of output with a relatively lower intensity of labour, making the productivity of each worker higher. Finally, the lower prices of domestically produced products would increase Europe competitiveness with an increase in exports equal to 1.19% after five years and would increase the disposable income of households leading to a 1.10% increase in employment. In Annex B we report the impulse response functions for each of the simulated scenarios.

Table 5.3: Scenario 1 Historical, undoing the 7.54% markup increase from 2000 (with 10-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.17	1.22	3.25	5.69	6.56
GDP deflator	-0.33	-1.95	-4.02	-5.15	-5.32
Consumption	0.29	1.26	3.41	5.57	6.26
Investments	-0.02	1.35	1.35	1.08	1.67
Employment	0.17	1.10	2.70	4.69	5.26
Profits	-0.58	-4.12	-8.94	-15.97	-22.82
Labour Productivity	0.04	0.30	0.68	1.03	1.33
Export	0.19	1.19	2.97	5.09	5.87
Import	-0.03	-0.01	-0.42	-1.13	-1.33

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

When including the TFP shock in the macroeconomic effects, the overall reaction of the economy is wider, as expected due to the magnification of the channels already discussed. Indeed, an increase in TFP elevates the economic potential of the region, thus amplifying the positive benefits of a more competitive business environment. The results presented in Table 5.4 show a GDP response of +7.49% after 20 years and a reduction in the price level of -4.38%.

Table 5.4: Scenario 1 Historical, undoing the 7.54% markup increase coupled with a TFP shock of +0.89%, from 2000 (with 10-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.17	1.39	4.24	7.49	9.22
GDP deflator	-0.45	-2.05	-3.48	-4.38	-4.44
Consumption	0.29	1.37	4.04	7.03	8.52
Investments	-0.01	2.51	3.57	3.57	4.25
Employment	0.26	1.07	2.65	4.43	4.93
Profits	-0.46	-3.92	-9.09	-15.97	-22.88
Labour Productivity	0.03	0.46	1.66	3.06	6.92
Export	0.24	1.34	3.12	6.16	8.42
Import	-0.05	0.18	-0.21	-1.07	-1.53

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

5.4.2 Scenario 2 results: Counterfactual markup shock based on empirical distribution

Under the *Trimming over the 97th percentile of markup distribution* scenario, a counterfactual distribution is created in which all markups above the 97th percentile are winsorized at that percentile. The percentage difference between the average markup in the actual distribution and the average markup in the winsorized distribution, using materials-based markups, is equal to -8.45%, with a phase-in period of 5 years.

Table 5.5 highlights how the decrease in the markup triggers an increase of real GDP equal 1.99% after five years and 4.03% after ten years.[356] The increase in competition brings about a decrease in inflation as measured by the GDP deflator change equal to -3.02% after five years. All the main components of aggregate demand increase. More specifically, after 5 years, a substantial increase in consumption (+2.04%) and investment (+2.07%) is observed, with a decrease in profits associated with the negative markup shock equal to -6.19%. Also, labour productivity is positively affected by the markup shock, with a 0.45% increase after five years. Finally, the lower prices of domestically produced products increase Europe competitiveness with an increase in exports equal to 1.78% after five years and increases the disposable income of households leading to a 1.55% increase in employment.

[356] *Macroeconomic results for coupled TFP shocks for the following scenarios are reported in Annex.*

Table 5.5: Scenario 2 Counterfactual markup shock based on trimming empirical distribution, 8.45% markup shock, from 2022 (with 5-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.40	1.99	4.03	6.46	7.38
GDP deflator	-0.72	-3.02	-4.94	-5.86	-5.99
Consumption	0.50	2.04	4.28	6.33	7.05
Investments	-0.03	2.07	1.72	1.23	1.88
Employment	0.38	1.55	3.34	5.33	5.92
Profits	-0.84	-6.19	-11.43	-18.14	-25.67
Labour Productivity	0.05	0.45	0.84	1.17	1.50
Export	0.42	1.78	3.74	5.78	6.60
Import	-0.07	-0.01	-0.52	-1.29	-1.50

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years.

Source: Project Team

5.4.3 Scenario 3 results: Counterfactual markup shock based on country convergence

The *Convergence* scenario simulates a situation in which the markup has an initial value of 1.157 and is hit by a persistent shock reduction equal to 8.38%, with a phase-in period of 5 years, reaching a level equal to 1.060. As described before, the effects of the shock propagate in the economy gradually. This dynamic ensures that the macroeconomic simulation examined is in line with the objective of studying a gradual and permanent increase in the level of competition.

As shown in Table 5.6, increase in competition brings about a decrease in inflation as measured by the GDP deflator change equal to -2.92% after five years, when the full size of the markup shock is implemented. All the main components of aggregate demand increase. More specifically, the decrease in the markup triggers an increase of real GDP equal to 1.93% after five years and 3.91% with a substantial increase in consumption and investments (+1.98% and +2.01%, respectively) over the same time horizon. Moreover, the negative markup shock is associated with a decrease in profits equal to -5.99%. Also, labour productivity is positively affected by the markup shock, with a 0.43% increase after five years. Finally, the lower prices of domestically produced products increase Europe competitiveness with an increase in exports equal to 1.73% after five years and increases the disposable income of households leading to a 1.50% increase in employment.

Table 5.6: Scenario 3 Counterfactual markup shock based on country convergence, -8.38% markup shock, from 2022 (with 5-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.39	1.93	3.91	6.26	7.14
GDP deflator	-0.71	-2.92	-4.77	-5.67	-5.80
Consumption	0.49	1.98	4.09	6.13	6.82
Investments	-0.03	2.01	1.62	1.19	1.82
Employment	0.40	1.50	3.25	5.16	5.73
Profits	-0.84	-5.99	-10.74	-17.57	-24.86
Labour Productivity	0.06	0.43	0.83	1.13	1.45
Export	0.38	1.73	3.63	5.60	6.40
Import	-0.07	-0.01	-0.48	-1.25	-1.45

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

5.4.4 Summary of the simulations' results

This study conducts a quantitative analysis of the potential macroeconomic impacts resulting from permanent changes in competition levels, measured as markup, at the EU-27 level. Following the recent literature (European Commission, 2023 and Pfeiffer et al., 2023), a scenario-based approach is adopted. This involves comparing a benchmark economy representing the 2022 status quo in European competition (2000 for the Historical scenario) with alternatives featuring a shock in markup, effectively increasing competition. The simulations, conducted using the MATER structural macroeconomic model, explore various markup shocks in terms of size and economic logic.

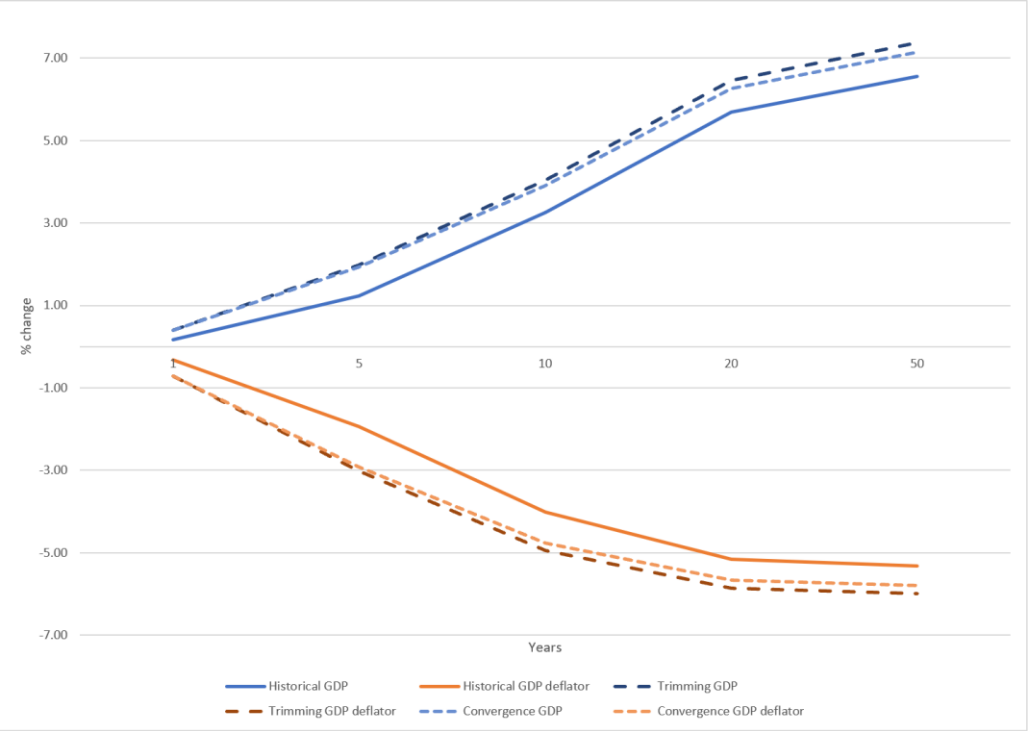
The modelling results indicate that if Europe would not have experienced an 7.54% increase in markup over the period 2000-2015, Europe could have had a GDP more than 4% higher in 2015 and more than 5% higher in 2020, with prices respectively lower by 3.3% and 3.5%. If we consider instead hypothetical increases in competition from today that reduce the markup by 8.45% this would translate to a potential increase in EU GDP by approximately 2.5% and 4.2% after five and ten years, respectively. Prices would be lower by 2.5% and 4.2% instead, leading to significant gains also in terms of employment, investments, and consumption.

Figure 5.6, Figure 5.7 and Figure 5.8 provide a synthetic comparison of the main findings of the macroeconomic simulations, focusing respectively on their impacts to economy-wide outputs, households related outputs and firms related outputs. Where for economy-wide outputs we refer to aggregate macroeconomic variables that are relevant for all agents in the economy. Households-related outcomes are instead those macroeconomic variables which refer specifically to the demand-side of the economy, such as households. Finally, firms-related outcomes are those macroeconomic variables representing the supply-side of the economy such as the producing sectors.

In particular, with respect to the whole economy, results suggest that a reduction in markup is associated with an increase in GDP between 3.25% and 4% after 10 years and a decrease in aggregate prices (GDP deflator) between 4.02% and 4.94% after 10

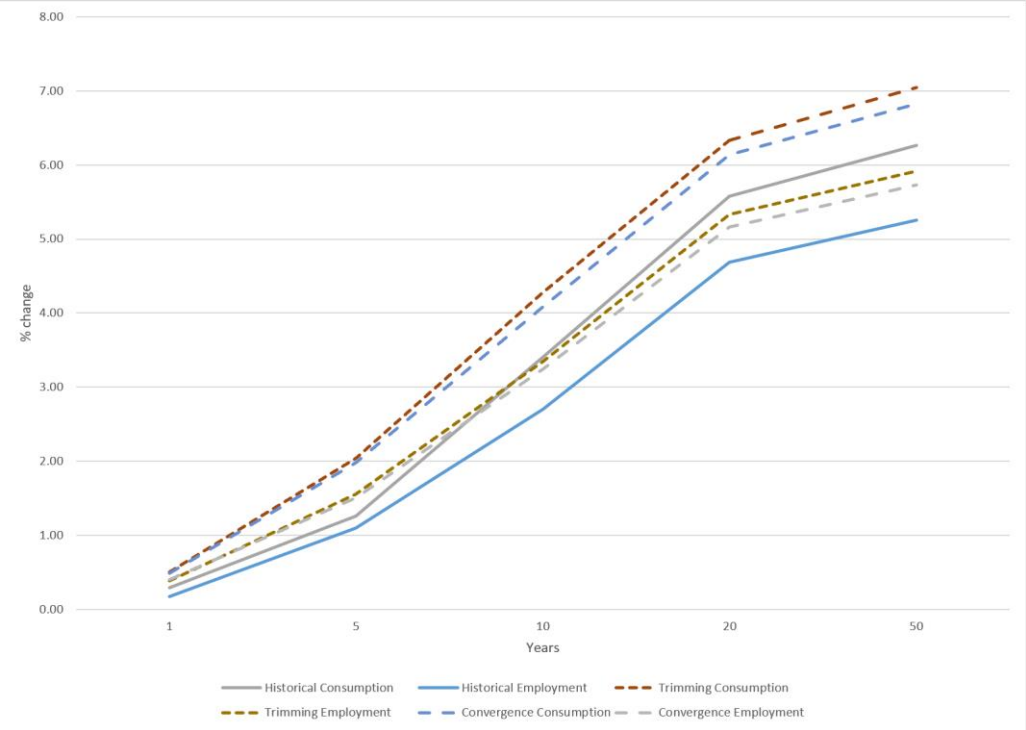
years, depending on the scenario considered. With respect to the impact on households, we find that a gradual, but permanent increase in competition would increase both consumption and employment in Europe, with a range between 3.41% and 4.28% for the former and a range between 2.70% and 3.34% for the latter, after 10 years. Finally, with respect to the impact for firms, we find that a reduction in markup would lead to an increase in investments and a significant reduction in profits, with ranges between 1.35% and 1.72% for the former and 8.94% and 11.93% for the latter after 10 years, depending on the scenario considered.

Figure 5.6: Comparison between scenarios for the impacts on the whole economy



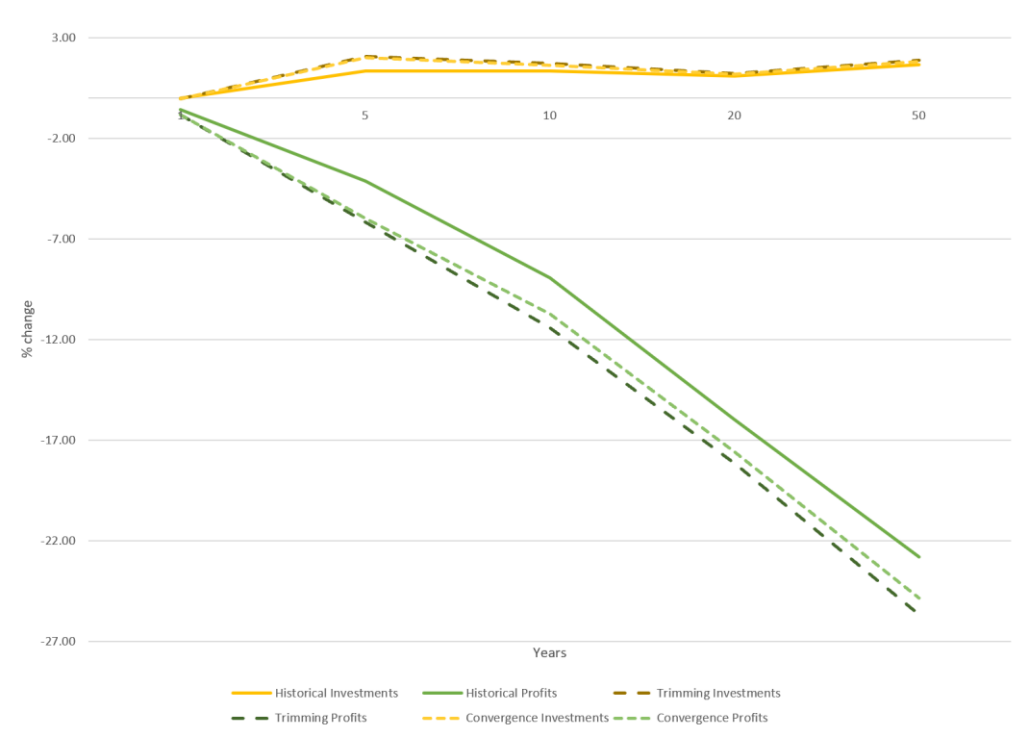
Source: Project Team

Figure 5.7: Comparison between scenarios for the impacts on households-related outcomes



Source: Project Team

Figure 5.8: Comparison between scenarios for the impacts on firms-related outcomes



Source: Project Team

In light of these results, it is possible to state that an increase in competition in Europe would lead to a sizable increase in welfare in the medium and long term. Considering not only the direct effect of more competition, but also the potential indirect effects on productivity, the benefits of competition would be even larger.

5.4.5 Contextualizing the MATER simulations' results with the existing literature

A useful exercise to gauge the reliability of the results obtained through the MATER model consists in benchmarking the quantitative estimates of the macroeconomic impacts of competition obtained via the MATER model with respect to those of the broad existing literature which investigated this topic.

Building on the comprehensive review presented in chapter 1, this section further extends the discourse by integrating the selection of studies with additional, relevant research presented in Table 5.7. The table shows the results of the MATER model alongside a selected list of papers that investigated changes in competition, either empirically or through model simulations. For sake of simplicity, MATER results are reported only in terms of GDP, whereas for each of the other studies listed, the table shows the result on the main macroeconomic variable investigated.

From the table, it is possible to gather that some studies found that competition changes affect productivity, GDP, or R&D (Baqaee and Fahri 2020, Barbero et al. 2022, Bighelli et al. 2023, Ciapanna et al. 2022, De Loecker et al. 2020, Díez et al. 2018, European Commission 2023, Forni et al. 2010, Moreau and Panon 2022, Pfeiffer et al. 2023), while others found effects on business dynamism (Akgicit et al. 2021, Babina et al. 2023) or market concentration (Alexander 1994), labour share (De Loecker and Eeckhout 2018, Eggertsson et al. 2021, Gutierrez 2017) and welfare (De Loecker et al. 2021).

While direct comparisons with the MATER model are complex due to differing methodologies and contexts, a common finding across virtually all studies, including the MATER model, is the generally positive impact of increased competitiveness on economic variables, thus confirming the alignment of the MATER model's results with existing literature.

Table 5.7: Relevant literature on competition impact at the macroeconomic level

Model/ paper	*Shock type*	*Shock size (annual in parenthesis)*[357]	*Time horizon*	*Country/ area*	*Macro-economic impact*
MATER Scenario 1. Historical	Markup	-7.54% (-0.39%)	2000-2020	EU27	5.69% GDP
MATER Scenario 2. Trimming	Markup	-8.45% (-0.88%)	2020-2030	EU27	4.03% GDP
MATER Scenario 3. Convergence	Markup	-8.38% (-0.87%)	2020-2030	EU27	3.91% GDP
Akgicit et al. (2021)	Markup	35.0% (0.84%)	1980-2016	Advanced economies	44% entry rate

[357] *Shock size has been annualized using the following formula: $(1+\text{Shock size})^{(1/\text{Time})}-1$*

Alexander (1994)	National industrial recovery act	Various measures	1933-1937	USA	58% reduction in concentration
Babina et al. (2023)	3055 antitrust lawsuits	Various measures	1971-2018	USA	5.4% employment, 4.1% business formation
Baker (2003)	Antitrust enforcement	Various measures	Different periods	USA	About $100 million yearly potential gain
Baqaee and Fahri (2020)	Markup	5.0% (0.27%)	1997-2015	USA	15% TFP
Barbero et al. (2022)	Institutional barriers removal in service sector 2006-2017	Various measures	2017-2027	EU27	4.65% GDP
Barkai (2020)	Markup	18.0% (0.54%)	1984-2015	USA	Pure profit increase by 13.55%
Bighelli et al. (2023)	Markup	1.2% (0.17%)	2009-2016	15 European countries	Accounts for 50% of productivity growth in that period
Cavalleri et al. (2019)	Markup	8.0% (0.22%)	1980-2015	Germany, France, Italy and Spain	Job finding rate and job separation rate decrease
Chicu et al. (2013)	National industrial recovery act	Collusion measure	1929-1935	USA	Increase in collusion
Ciapanna et al. (2022)	Markup & TFP	-1.1% (-0.22%)	2008-2013	Italy	Increase by 3.5% in TFP. Higher GDP between 3.5% and 8%
Ciarreta (2012)	Regulation and competition policy	Various measures	1976-1990	Sweden	Increase in prices and decrease in sales due to horizontal collusion
Dasgupta and Zaldokas (2019)	Antitrust enforcement	Leniency laws	1990-2012	World (63 countries)	Firms' assets grow by more equity issuance
De Loecker and Eeckhout (2018)	Markup	66.3% (1.42%)	1980-2016	Europe	34% labour share
De Loecker et al. (2020)	Markup	42.0% (0.65%)	1960-2014	USA	Investment, TFP, potential growth and output gaps, labour share
De Loecker et al. (2021)	Markup	39% globally (0.92%),	1980-2016	Multiple countries	Lower welfare by 9%

		61% Europe (1.33%)			
Díez et al. (2018)	Markup	39% (0.92%)	1980-2016	Advanced economies	Reduction in investments and R&D
Díez et al. (2019)	Markup	10.0% (0.64%)	2000-2015	Advanced economies	0.6% physical capital investment rate
Eggertsson et al. (2021)	Markup	-2.0% (-0.04%)	1970-2015	USA	Multiple outcomes (labour share, investments, interest rate)
European Commission (2023)	Markup	1.2% (0.12%)	2022-2032	EU27	0.75% GDP (after 10 years)
Forni et al. (2010)	Markup	16.0% (1.50%)	1996–2006	Italy	10.8% GDP
Gutierrez (2017)	Markup	5.0% (0.14%)	1980-2014	USA	7% labour share decline
Gutiérrez and Philippon (2018)	Antitrust enforcement	Various measures	1990-2015	EU	Markup reduction
Konczal and Lusiani (2022)	Markup	37.0% (0.48%)	1955-2021	USA	A third explanatory factor in inflation in 2021
Moreau and Panon (2022)	Breaking down French cartels	Various measures	1994-2007	France	2% increase in aggregate productivity and 3.5% in welfare
Pfeiffer et al. (2023)	PMR	23.0% (2.09%)	2022-2032	EU-27	0.6% GDP increase

Source: Project Team based on cited literature

5.5 Conclusions

The increasing market power of firms over the last decades, as documented for most advanced economies by a substantial body of economic literature, came at a cost. Reversing this trend by favouring a more competitive landscape in the future might be beneficial for the economy as a whole. The study quantified, for the EU, the magnitude of both the historical loss and the potential gain, employing a comprehensive scenario-based methodology that integrates micro and macro-level analyses.

The micro-level examination measured the market power of firms through markup levels derived from balance-sheet data of more than 100,000 enterprises across various European countries. These estimates, benchmarked against those of similar previous studies, confirmed an overall increasing trend of markups within the single market. However, a diversified picture emerges among member states and industries, with services depicting the highest level of markups and thus the largest room for improving the competitive environment. The correlation between profitability and markups validates that the latter are reliable indicators of firms' market power. Changes in

markups serve as qualified instruments to simulate different scenarios for competition in the EU market.

The study applied alternative scenarios of markups at the EU level as input for a proprietary general equilibrium model, assessing the consequences of the change in competition on the most relevant economic variables. One scenario, labelled historical, quantified the cost of the rise in European markups since 2000 (7.54% according to an average of the results selected benchmark studies). Over 20 years, this deterioration of the competitive landscape made the EU GDP 5.7% smaller, with consumers facing prices 5.2% higher than if the degree of competition had remained stable.

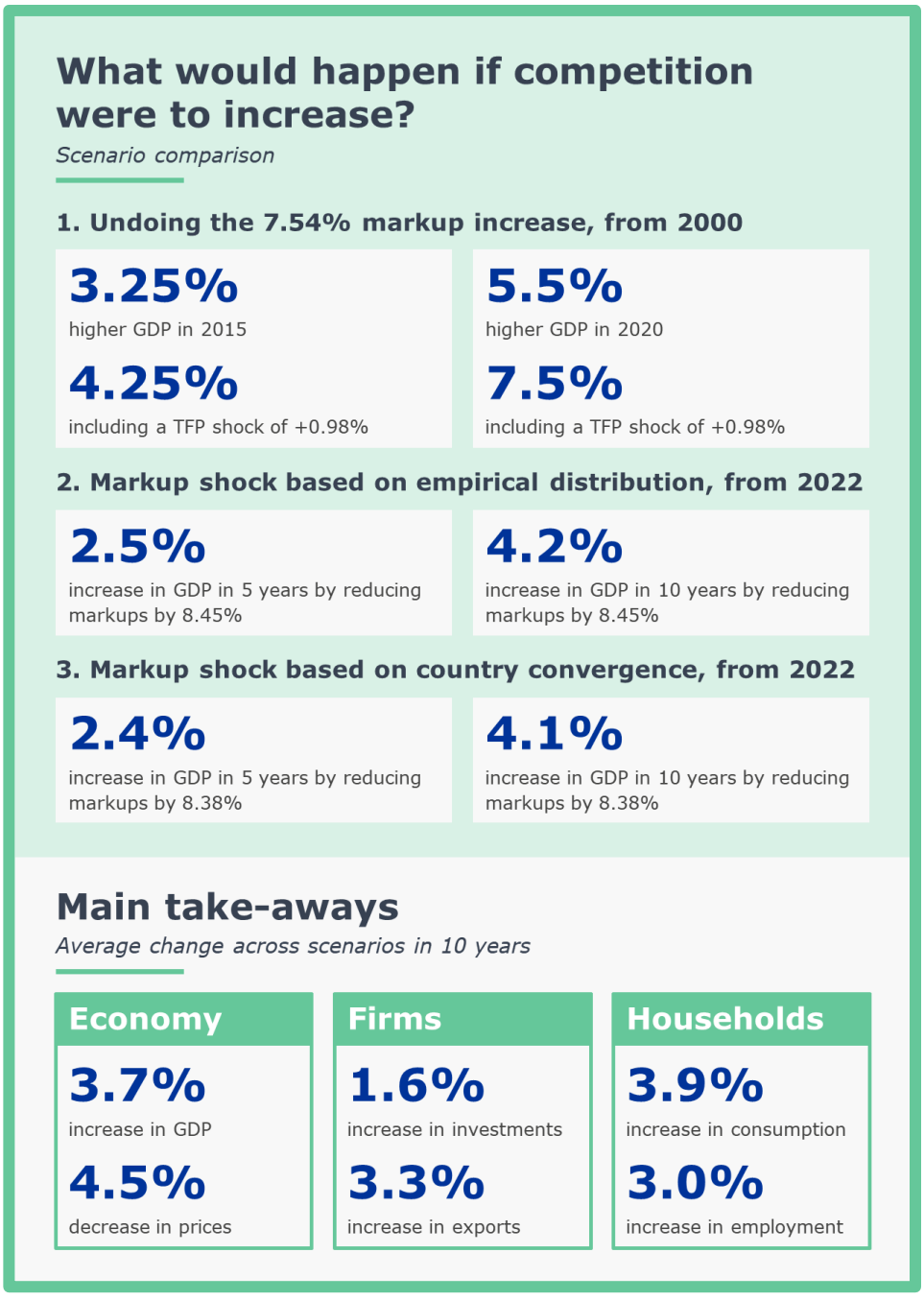
The other two scenarios demonstrated how part of this loss can be offset by favoring a more competitive-friendly environment in the future of the single market. Acting today to limit the excess profitability of the top 3% markup firms would decrease the average markup by 8.45%, triggering a 2% gain in GDP in the next five years. Of note how the macroeconomic framework adopted in the study offers a comprehensive picture of different possible effects of a shock on competition, confirming an impact on corporate profits (negative), employment, household consumption, investment, labor productivity, and net export (all positive). Similar impacts on the overall markup and, consequently, in terms of GDP gains might result from implementing the third alternative scenario, where disparities in terms of competition among Member States are reduced, and particularly countries with higher markups converge to the EU average.

While none of these forward-looking scenarios can restore the estimated historical cost in the short term, both scenarios assert that reducing firms' market power significantly benefits consumers by protecting their purchasing power and the enterprise sector, fostering growth for the entire economy. More competition is shown to contain price evolution, supporting households' in consumption and driving further investments from firms.

The report empirically highlights also the positive link between competition and TFP and provides estimates of potential gains within the scenarios, factoring in this additional effect. This evidence not only magnifies all the benefits but also underscores how promoting competition can support a fundamental aspect for the long-term prosperity of EU.

The infographic in Figure 5.9 below summarizes the main outcomes of the analysis presented in this chapter. It addresses the question “what would happen if competition were to increase?” through key numerical indicators, offering an overview of the average changes across scenarios over a 10-year horizon, from the perspective of the entire economy, firms, and households.

Figure 5.9: Cost of non-competition infographic



Source: Project Team

Some caution is warranted in the interpretation of these results. Competition is a complex and multi-faceted process and can take different shapes depending on the market at hand. Measuring it accurately is a challenging task, and every proxy that can be used for this purpose has some sources of imperfection. Markups are no exception: their rise can underlie an increase in market power, and thus weaker competition, but also, *inter alia*, efficiency gains. Further, the stylized nature of the assumptions and simulations inherent in the macro-economic modelling call for caution in directly translating theoretical results into real-world impacts. Despite these limitations, however, our results confirm that more effective competition – as proxied by markups – is shown to benefit the economy through various channels, and in particular to curb

inflation, fostering increased households' consumption, and driving further investments from enterprises. They also show that, while non-negligible gains could be obtained in a relatively short time, it would take a long-term commitment to undo the loss caused by the recent rise in markups.

In a nutshell, the analysis shows consistent results across scenarios which boil down to the following: more effective competition across the EU could significantly propel the economy, with projections showing, on average, a potential GDP increase of 3.7%, and a decrease in prices by 4.5%. At the same time, firms would see a 1.6% rise in investments and an improvement in international competitiveness (+3,27% in exports), while households would experience a 3.9% boost in consumption and 3.0% growth in employment over the next decade.

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Annex B Price concentration studies: annexes

B.1 Mobile telecoms: prices

Table B.1: Summary Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
ARPU (USD)	4,337	20.4	10.77	1.33	58.02
Market share	4,356	0.29	0.11	0	0.53
HHI	4,357	0.32	0.05	0.18	0.5
N MNOs	4,357	3.49	0.52	2	5
N MVNOs	4,357	23.46	24.00	0	99
CAPEX (country level)	4,357	711.94	1668.97	5.27	13278.08
4G Coverage	4,357	0.6	0.42	0	1
Population (Millions)	4,357	39.55	64.61	1.32	330.03
Percapita GDP (USD)	4,357	33395.69	11945.07	10755	82583
Urban %	4,357	75.70	11.50	53.70	98.04
Plus65 %	4,357	17.67	3.05	10.71	29.28
Active %	4,357	50.24	3.19	41.12	59.02
MTR (country level)	2,531	1.43	1.03	0.4	6.32
MTR standard deviation	2,531	0.08	0.43	0	3.9

Source: Project Team based on data from ITU and GSMA.

Table B.2: Variation in the number of MNOs across countries

Country	*Q1 2009*	*Q4 2019*	*Variation*
Australia	4	3	-1
Austria	4	3	-1
Belgium	3	3	0
Canada	3	3	0
Czechia	3	3	0
Denmark	4	4	0
Estonia	3	3	0

Finland	3	3	0
France	3	4	1
Germany	4	3	-1
Greece	3	3	0
Hungary	3	3	0
Ireland	4	3	-1
Italy	4	4	0
Japan	4	3	-1
Korea; South	3	3	0
Latvia	3	3	0
Lithuania	3	3	0
Netherlands	3	3	0
New Zealand	2	3	1
Norway	4	3	-1
Poland	4	4	0
Portugal	3	3	0
Romania	4	4	0
Slovakia	3	4	1
Spain	4	4	0
Sweden	4	4	0
United Kingdom	5	4	-1
United States of America	4	4	0

Source: Project Team calculation from GSMA data

Table B.3: Multimarket contact in the European mobile telecommunications market

Country	*CK Hutchison*	*Deutsche Telekom*	*Orange*	*Tele2*	*Telefonica*	*Telenor*	*Telia*	*Vodafone*
Austria	X	X						
Belgium			X					
Czechia		X						X
Denmark	X					X	X	
Estonia				X			X	
Finland						X	X	
France			X					
Germany		X			X			X
Greece								X
Hungary								X
Ireland	X							X
Italy	X							X
Latvia				X			X	
Lithuania				X			X	
Netherlands		X						X
Norway						X	X	
Poland		X	X					X
Portugal			X					X
Romania			X					X
Slovakia		X	X			X		
Spain			X		X		X	X
Sweden	X			X	X	X	X	
United Kingdom	X	X						X

Source: Project Team calculation from GSMA data

Our empirical strategy follows the one proposed by Genakos et al. (2018). We adopt a panel data approach with fixed effects for countries and time periods, exploiting plausibly exogenous variation in market structure. In particular, for the empirical analysis on price, the baseline equation to be estimated takes the following form:

$$\ln ARPU_{o,c,t} = \beta_0 + \beta_1 MNO_{c,t} + \beta_2 X_{o,c,t} + \alpha_c + \tau_t + \epsilon_{o,c,t}. \qquad B.1$$

The dependent variable of Equation (1) is the logarithm of the average revenue per connection (in USD) of mobile operator o, in country c, at time (quarter) t. Country (α_c) and time (τ_t) fixed effects control for time-invariant country characteristics and global trends in ARPU, respectively. $X_{o,c,t}$ is a vector of observable characteristics at operator and/or country level. Finally, $\epsilon_{o,c,t}$ is the mean-zero error term.

When we turn to the analysis on aggregate investment in mobile telecommunications, we estimate the following equation:

$$\ln \boldsymbol{CAPEX_{c,t}} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 MNO_{c,t}} + \boldsymbol{\beta_2 X_{c,t}} + \boldsymbol{\alpha_c} + \boldsymbol{\tau_t} + \boldsymbol{\epsilon_{c,t}} \qquad B.2$$

Where the dependent variable is the natural logarithm of total CAPEX across mobile operators in country c and time (quarter) t.

Our main variable of interest is $MNO_{c,t}$, which counts the number of operators in country c and quarter t. The associated coefficient is correctly estimated if such a variable is not correlated to unobservable factors affecting the dependent variable. This would happen if, for instance, entry is the result of a shift in demand of mobile services, which in turn would affect price and investment. However, as suggested by Genakos et al. (2018), the mobile industry is not a free-entry industry. Instead, operators need to be awarded spectrum licences to operate in the market. As spectrum allocation does not depend on market conditions, but rather on the regulatory environment of the different countries, the number of MNOs is plausibly exogenous conditional on the full set of countries and time fixed effects.

Alternative specifications of Equations (1) and (2) include also the number of MVNOs in country c and quarter t ($MVNO_{c,t}$) to capture the impact of MVNOs' entry on operators' ARPU. Additionally, we also replace $MNOc,t$ with the $HHIc,t$, which has considerably more within-country variation, providing also a smoother measure of market concentration. However, both $MVNOc,t$ and $HHIc,t$ suffer from endogeneity concerns. The first because MVNOs leverage on mobile operators' networks, and network access is usually the outcome of a voluntary agreement between MNO and MVNO. This is likely to affect certainly investments, since MVNO entry increases the demand for broadband capacity but also prices, since MNOs could react by repositioning their product portfolio. On the other hand, HHI is prone to endogeneity concerns because it is determined by market shares, which in turn depend on prices and investment.

To account for this endogeneity issue, we apply an instrumental variable approach, using two complementary instruments. The first one, following the previous discussion, is the number of MNOs, the main identifying assumption being that variation in the number of MNOs, either through merger or entry, affects price and investment only through the variation in market concentration. Second, we use difference in MTR in country c and time t. MTRs are payments an operator has to face when it wants to terminate the call on rival's network. As pointed out by Genakos et al. (2018), regulators have repeatedly regulated MTRs, for instance, by imposing asymmetric conditions between large and small MNOs. In doing so, they aimed to level the playing field between historical incumbents and new entrants. Therefore, while the level of MTRs can affect prices, the within-country difference should correlate with market concentration without a direct effect on prices and investment. Therefore, we use the standard deviation of MTRs in country c and time t as an additional instrument in the instrumental variable estimation.

Table B.4: First stage regressions

	(1)	(2)	(3)	(4)

VARIABLES	HHI	HHI	HHI	MVNO
MNO	-0.047***		-0.049***	-0.991***
	(0.001)		(0.002)	(0.267)
sd MTR		-0.006***	-0.000	0.726***
		(0.001)	(0.001)	(0.142)
Observations	3,132	2,511	2,511	2,511
R-squared	0.416	0.107	0.443	0.087

*Note: All regressions include country and time fixed effects. Robust standard errors in parentheses. ***p<0.01, ** p<0.05, * p<0.1.*

Source: Project Team calculations

Table B.5: Estimates when using ITU pricing basket data

	(1)	(2)	(3)	(4)
VARIABLES	OLS	OLS	OLS	IV
MNO	-0.074	-0.032		
	(0.065)	(0.069)		
HHI			1.542	0.694
			(1.159)	(1.463)
Controls		YES	YES	YES
First Stage F-test				149.1
Observations	319	319	319	319

*Note: All regressions include country and time fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Source: Project Team calculations

Table B.6: Estimates when exploiting market entry

	(1)	(2)	(3)	(4)
VARIABLES	OLS	IV	OLS	IV
MNO	-0.168***		0.277***	
	(0.028)		(0.067)	
HHI		2.937***		-3.854***
		(0.498)		(1.275)
Dep var.	ARPU	ARPU	CAPEX	CAPEX
First Stage F-test		634.6		192.2
Observations	2,758	2,758	836	836

*Note: All regressions include country and time fixed effects. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Source: Project Team calculations

Table B.7: Estimates when including small MNOs

	(1)	(2)	(3)	(4)
VARIABLES	ARPU	ARPU	CAPEX	CAPEX
MNO	-0.029***	-0.049***	0.021***	0.130***
	(0.004)	(0.011)	(0.007)	(0.017)
Sample	All data	Europe	All data	Europe
Observations	5,004	3,644	1,276	1,012
R-squared	0.837	0.813	0.975	0.967

*Note: All regressions include country and time fixed effects, as well as time varying country-level controls. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Source: Project Team calculations

B.2 Mobile telecoms: investment

Table B.8: Relationship between number of MNOs and CAPEX per unit

VARIABLES	(1) All data	(2) All data	(3) Europe	(4) All data	(5) Europe
MNO	0.052*	0.072**	0.057*	0.081***	0.059*
	(0.029)	(0.030)	(0.034)	(0.029)	(0.034)
MVNO				0.002*	0.001
				(0.001)	(0.002)
Observations	1,276	1,276	1,012	1,276	1,012
R-squared	0.826	0.834	0.852	0.835	0.852

Source: Project Team calculations

B.3 Airlines

Table B.9: Relevant Literature on price effects of Airline Mergers

Author/Year	*Main effect reported*
Borenstein (1990)	Price increase
Werden, Joskow, and Johnson (1991)	Price increase
Peters (2006)	Price increase
Mehta and Miller (2012)	Price increase
Luo (2014)	No price increase / Price increase
Hüschelrath and Müller (2015)	Price increase
Jain (2015)	Price increase
Carlton et al. (2019)	Price reduction

Source: Project Team

B.3.1 Data Treatment for the EU Descriptive Analysis

Data Source

The data provided by Cirium contains roundtrip flights divided into their directional coupon. The data are monthly aggregates of the number of passengers and prices at the directional route/airline level between 2015-01-01 and 2019-12-31. It contains in total 1,315,836 observations. For each observation, the number of passengers and their average fare for the economy class, the business class and the first class. In the database, 246 airlines operate 16,371 directional routes. In the 5 years of the sample, 599,724,473 yearly passengers are transported for a total yearly gross sale of 55,667,349,475€.

To the Cirium dataset, we add ancillary dataset from various sources:

- We use the openflights database to identify the location of airport and compute the distance between airports;
- We exploit ICAO's classification of airlines into legacy and low-costs;
- We use data from Eurostat at the NUTS-2 level of aggregation to add ancillary information to airports and the market they serve, namely:
    - Demographics
    - GDP per capita at market price
    - Accommodations for Tourists
- Kerosene Prices;
- Price index.

Data Filtering

Following the literature, we remove negligeable routes as a first step. Removing negligeable routes help to avoid counting having many small routes representing a negligeable part of total gross sales biasing the econometric analysis. We operate two filters:

1. Remove routes with less than 833 average monthly passengers on the sample. Counting that a relatively short European connection's plane has between 100 and 250 seats. 833 monthly passengers correspond roughly to less than 8 flights a month. The adoption of an average criteria on the full sample does penalize seasonal routes but remains the most efficient criteria.
2. Remove from remaining routes airlines that represent less than 1% of passengers. A common issue of these market structure analysis is to identify what a market competitor is. Setting an appropriate threshold is a difficult task due to the seasonality and the easy entry of potential competitors in a route. We discard the presence of airlines from a route if they represent less than 1% of passengers.

These criteria together remove 4,998 routes, about 20%. By removing these routes and airlines that do not represent serious competition, we remove about 2.03% of gross sales from the dataset.

B.3.2 Data preparation for the US Analysis

Data Source

We downloaded data from the DB1B database. The DB1B database contains information at the coupon/quarter/route level. To match the format of the European data, we first need to implement several different steps. We first limited the analysis to roundtrip flights, and removed tickets that contain more than 4 coupons. We also removed tickets that marketed by several carriers at once. Then we aggregated the information at the quarter/carrier/route level, matching the Cirium database. The final data contains 10,322,262 observations. For each observation, we reconstructed the same data as in the Cirium database: the number of passengers and the average fare. In the data, 133,715 routes are operated by 165 airlines transporting 336,502,212 yearly passengers for a yearly total of 63,503,324,170$.

To the DB1B dataset, we also add ancillary data from various sources:

- From the Bureau of Economic Analysis we use data at the metropolitan area level on:
    - Demographics
    - Tourism by accounting income from accommodation
    - GDP per capita

- CPI from Fed Fred;
- Kerosene prices.

Data Filtering

Like in the European case, we started by filtering out routes with a low number of passengers, and then filtering out from routes airlines that do not represent more than 1% of passengers.

1. Discard routes with less than 50 average quarterly passengers.
2. Discard from routes airlines representing less than 1% of average quarterly traffic.

We then discarded, as in the European market case, airlines that should not count as a competitor on routes. Both filtering discard 92,751 routes, about 70% of routes, representing however only 1.6% of total gross sales.

Table B.10: Top-30 Airlines in EU by number of passengers (un-consolidated)

Rank	*Airline*	*Average monthly passengers*
1	Ryanair	9649976
2	Easyjet	5417466
3	Lufthansa	3423446
4	Vueling Airlines	2413309
5	Air France	2200912
6	British Airways	2151990
7	Germanwings/Eurowings	1876668
8	Wizz Air	1669438
9	Air Berlin	1648183
10	KLM Royal Dutch Airlines	1506771
11	Iberia	1471894
12	Italia Transporto Aereo	1456152
13	Norwegian Air Sweden	1207854
14	Scandinavian Airlines System	1199350
15	Jet2	951080
16	Aer Lingus	870947

17	TAP Portugal	848990
18	Flybe	827568
19	Finnair	773088
20	Air Europa Lineas Aereas	732244
21	Austrian	703436
22	Transavia Airlines	600501
23	Aegean Airlines	600312
24	Brussels Airlines	561490
25	Volotea	538933
26	LOT Polish Airlines	477674
27	Air Albania	477161
28	Condor	471189
29	Malta Air Travel	465390
30	Olympic Air	432070

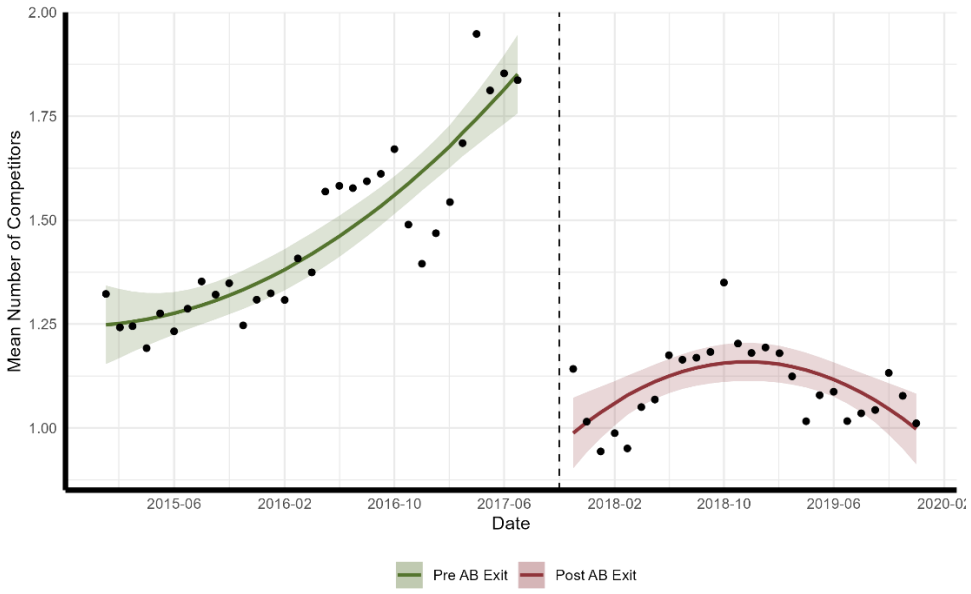
Source: Project Team based on Cirium data

Table B.11: Regression model for the fare per mile

Dependent variable: price per mile						
	EU market			**US market**		
	(1)	(2)	(3)	(4)	(5)	(6)
Monopoly	0.0102***	0.0090***	0.0082***	0.2190***	0.0161***	0.0164***
	(0.0005)	(0.0004)	(0.0003)	(0.0015)	(0.0008)	(0.0008)
Duopoly	0.0177***	0.0044***	0.0039***	0.1116***	0.0097***	0.0100***
	(0.0005)	(0.0003)	(0.0003)	(0.0012)	(0.0005)	(0.0005)
Triopoly	0.0117***	0.0016***	0.0014***	0.0395***	0.0015***	0.0017***
	(0.0006)	(0.0003)	(0.0003)	(0.0010)	(0.0003)	(0.0004)
LC Share	-0.1035***	-0.0249***	-0.0256***	-0.1863***	-0.1268***	-0.1268***
	(0.0004)	(0.0004)	(0.0004)	(0.0014)	(0.0011)	(0.0011)
Fuel price	0.0093***	0.0086***		0.0147***	0.0007***	
	(0.0008)	(0.0003)		(0.0013)	(0.0003)	
Time Trend	-0.0003***	-0.0002***		-0.0034***	-0.0019***	
	(0.0001)	(0.00004)		(0.0001)	(0.0002)	
Dep. Var. mean	0.1502	0.1493	0.1493	0.2606	0.2777	0.2777
Route level controls	Yes	No	No	Yes	No	No
Month FEs	Yes	Yes	No	Yes	Yes	No
Route FEs	No	Yes	Yes	No	Yes	Yes
Period FEs	No	No	Yes	No	No	Yes
R^2	0.214	0.889	0.893	0.2	0.948	0.949
Observations	412,631	474,559	474,559	162,877	296,744	296,744

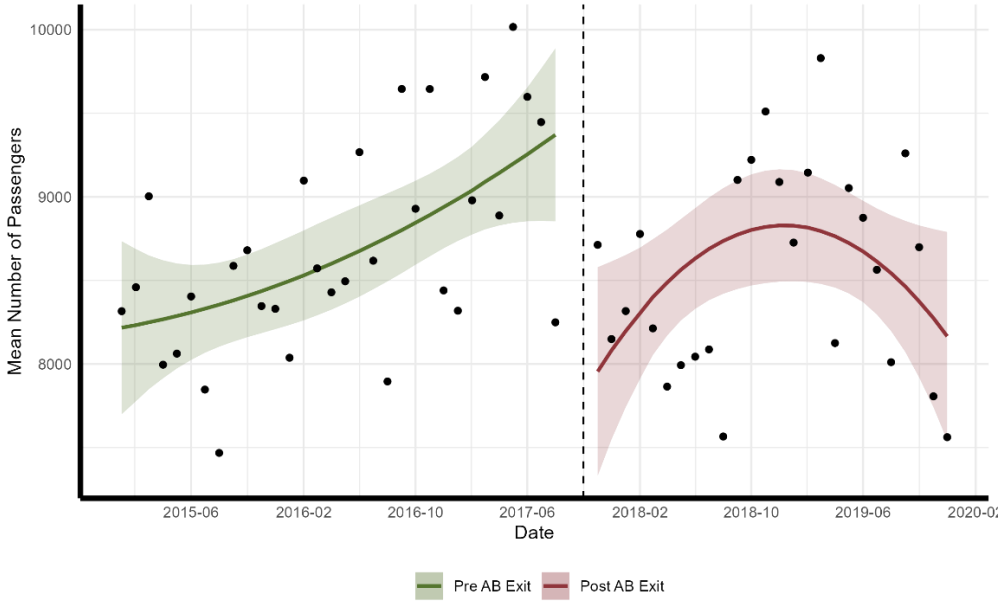
Notes: The table reports the estimated coefficients of a panel regression for the fare per mile. The dependent variable in columns (1) to (3) is the fare per mile in EU measured in Euro, while the dependent variable in columns (4) to (6) is the fare per mile in US measured in US dollars. The list of explanatory variables include a set of indicator variables for the market structure: Monopoly, Duopoly, Triopoly which take value 1 if the route is served by 1, 2, or 3 airlines respectively. Depending on the specification, the regression model also includes demographic characteristics at the origin and at the destination and other factors (Route level controls), the relevance of Low-cost carriers (LC share), and the international price of jet fuel (Fuel price). Depending on the specification, we model trends and seasonality by including month or quarter fixed-effects (from 1 to 12, labelled Month Fes), or period Fes (from 1 increasing until the end of sample, labelled Period Fes). Depending on the specification, we also include Route fixed effects, to capture all factors, observed and unobserved, that pertain to the route and do not vary in the time period considered (Route Fes). Source: Projest team based on data from Cirium, Eurostat, the Bureau of Transportation statistics, US Census, Federal Reserve Economic Data (FRED)

Figure B.1: Number of airlines in Air Berlin routes before (green) and after (red) Air Berlin's exit: more concentrated routes



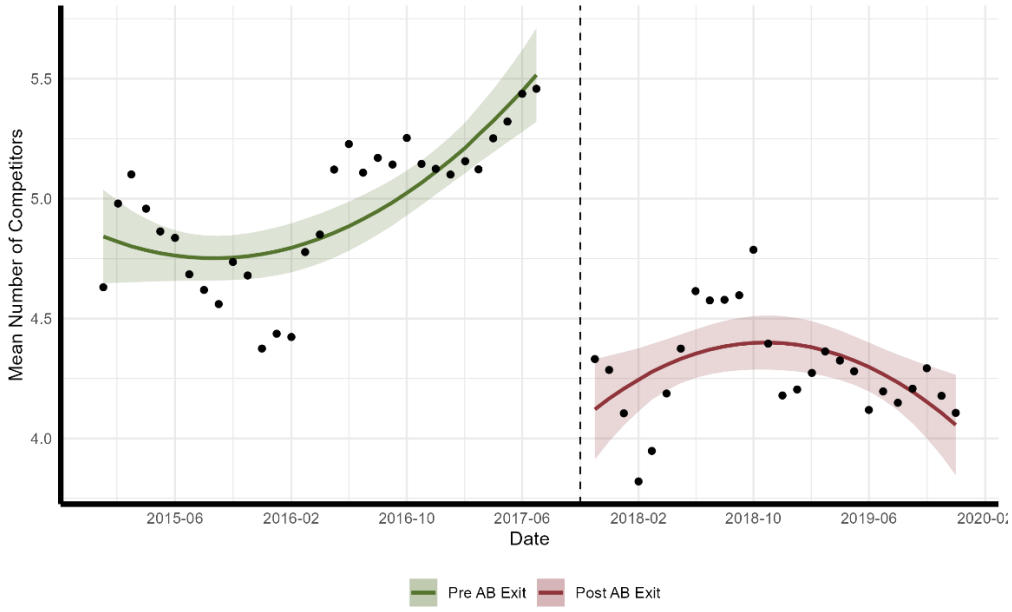
Source: Project Team based on Cirium data.

Figure B.2: Number of passengers in Air Berlin routes before (green) and after (red) Air Berlin's exit: more concentrated routes



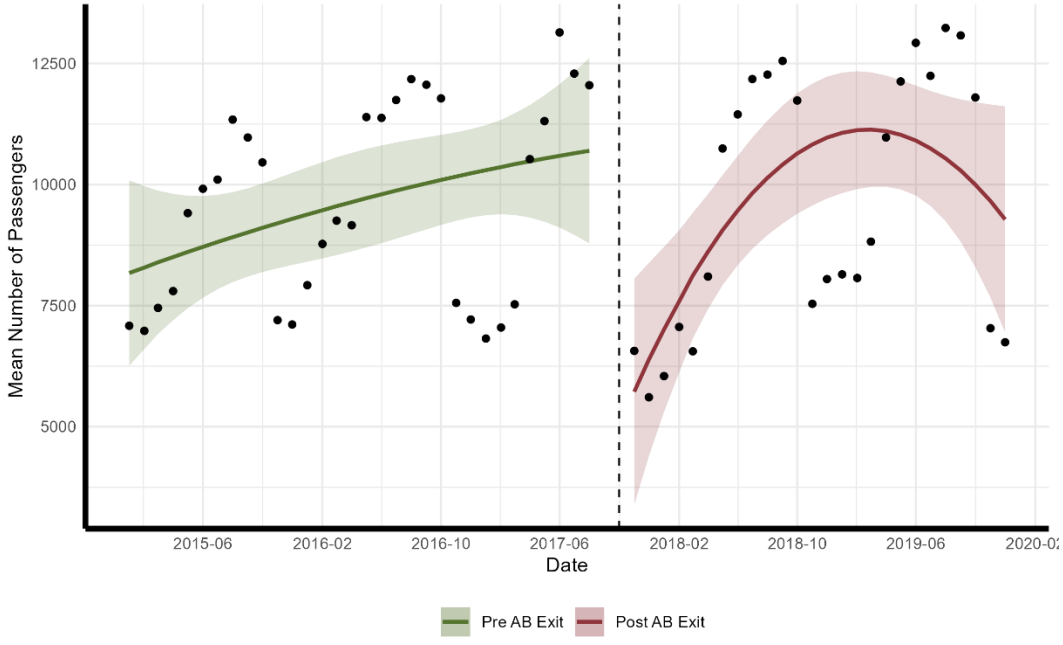
Source: Project Team based on Cirium data

Figure B.3: Number of airlines in Air Berlin routes before (green) and after (red) Air Berlin's exit: less concentrated routes r



Source: Project Team based on Cirium data

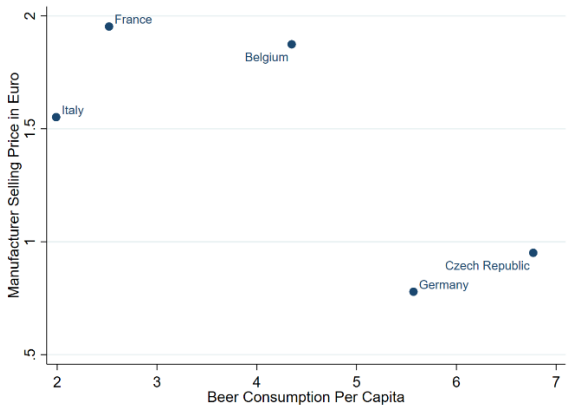
Figure B.4: Number of passengers in Air Berlin routes before (green) and after (red) Air Berlin's exit: less concentrated routes



Source: Project Team based on Cirium data

B.4 Beer

Figure B.5: Beer Price in euro and beer consumption per capita for 5 Member States



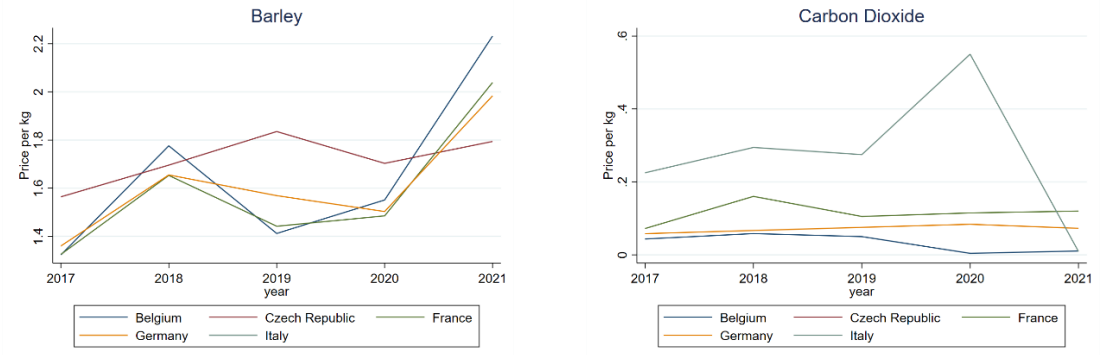
Source: Alethius calculations on Euromonitor Passport data

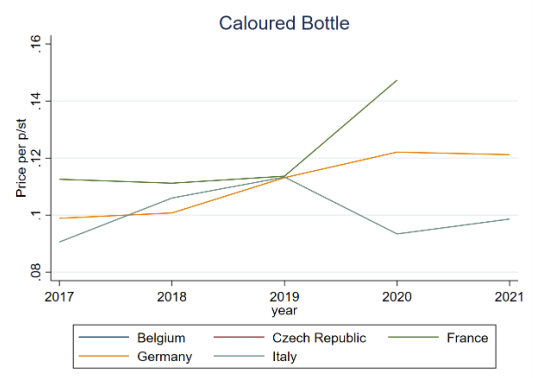
Table B.12: 2022 Advertisement Costs and Revenues for the Top 3 Beer Companies

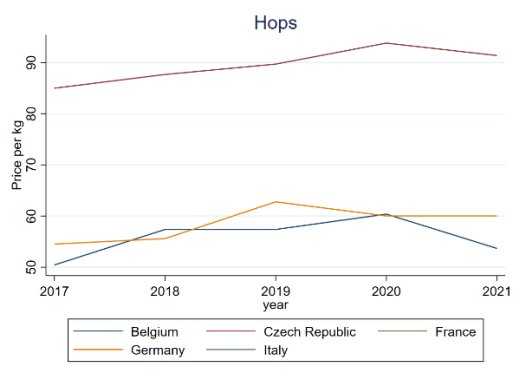
Company	*Marketing and Selling Expenses*	*Revenues*
ABinBev	6,752$	57,786$
Heineken	2,931$	37,435$
Carlsberg	1,592$	10,177$

Source: Project team based on 2022 Annual reports. Data are in USD million.

Figure B.6: 2017-2021 Input Prices for the 5 Member States



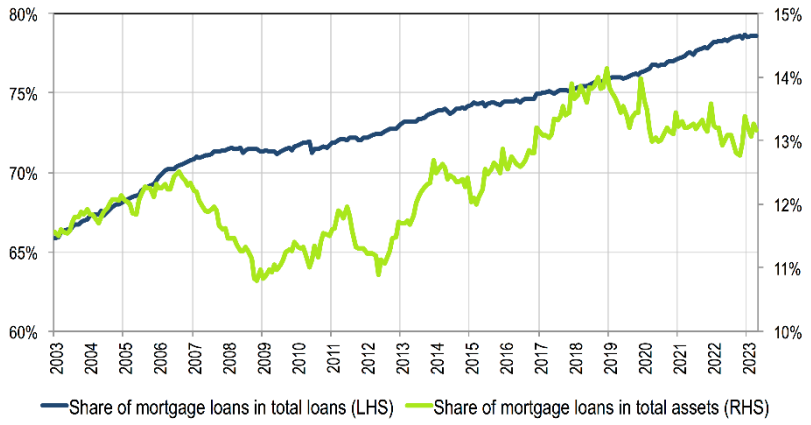




Source: Project Team based on data: PRODCOM data (Eurostat)

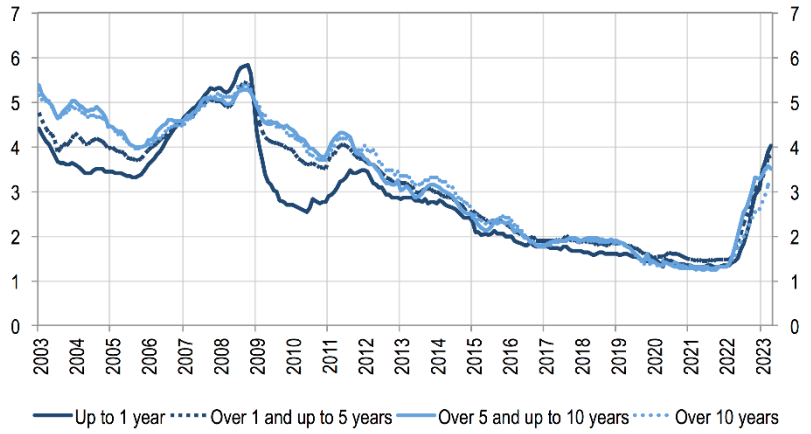
B.5 Mortgages

Figure B.7: MFIs lending for house purchase to households, Euro Area



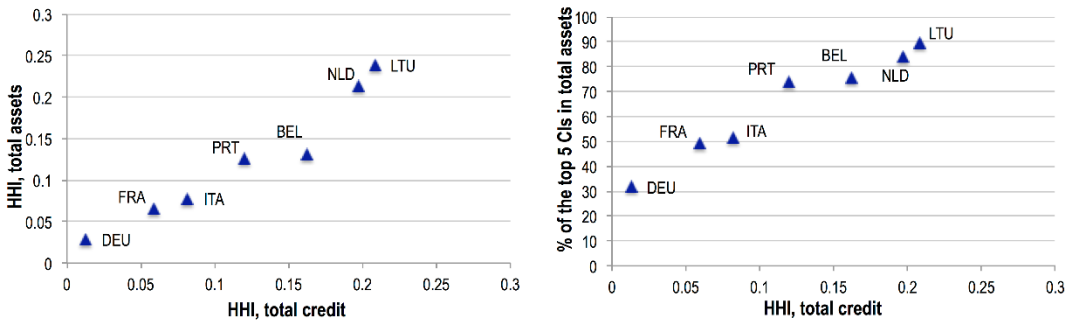
Source: ECB Statistical Data Warehouse

Figure B.8: Fixed vs. variable rate on new mortgage loans to households



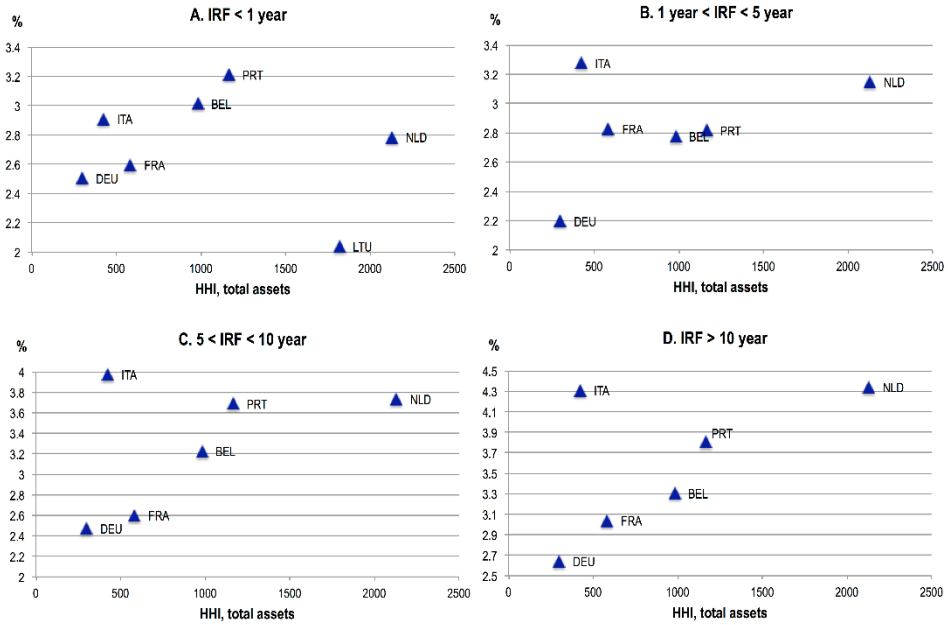
Source: ECB Statistical Data Warehouse

Figure B.9: Correlation between the various concentration measures



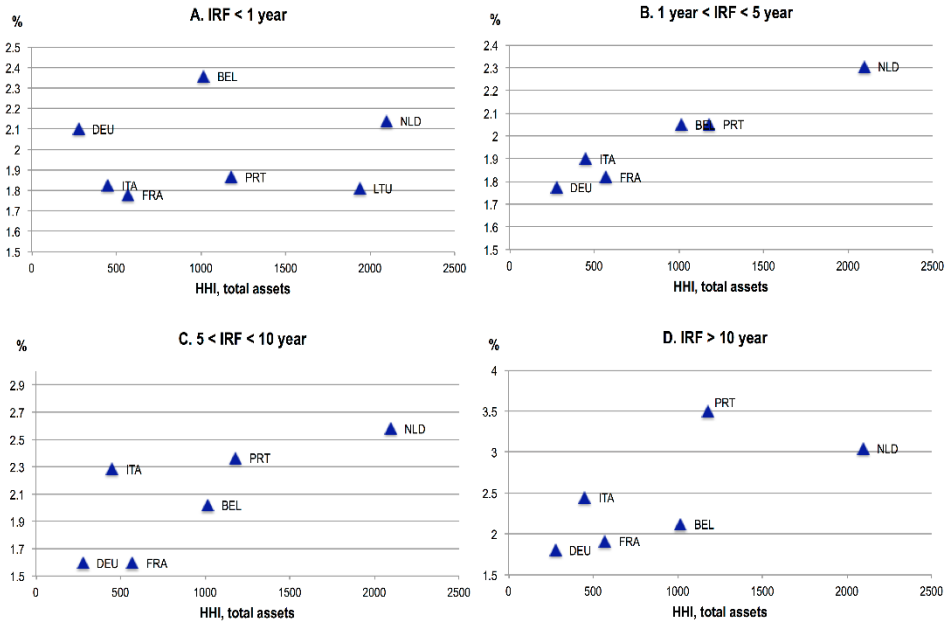
Source: ECB Statistical Data Warehouse

Figure B.10: Robustness: price-concentration year 2014



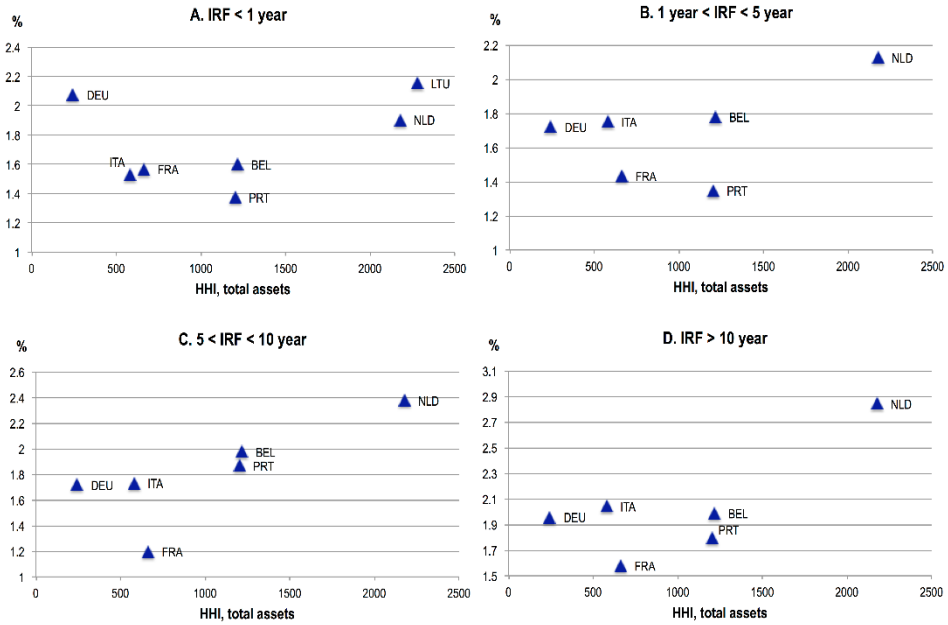
Source: ECB Statistical Data Warehouse

Figure B.11: Robustness: price-concentration year 2016



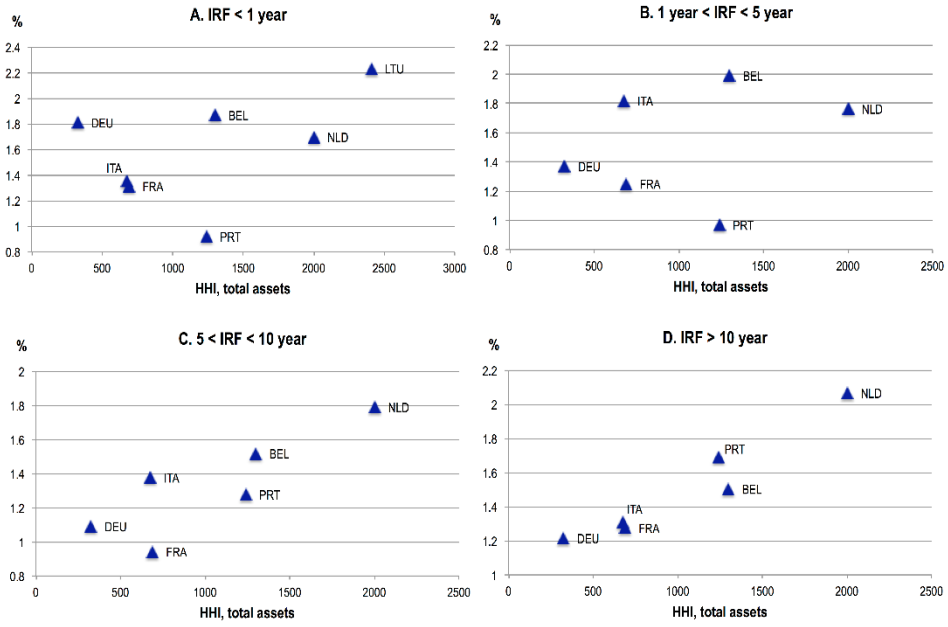
Source: ECB Statistical Data Warehouse

Figure B.12: Robustness: price-concentration year 2018



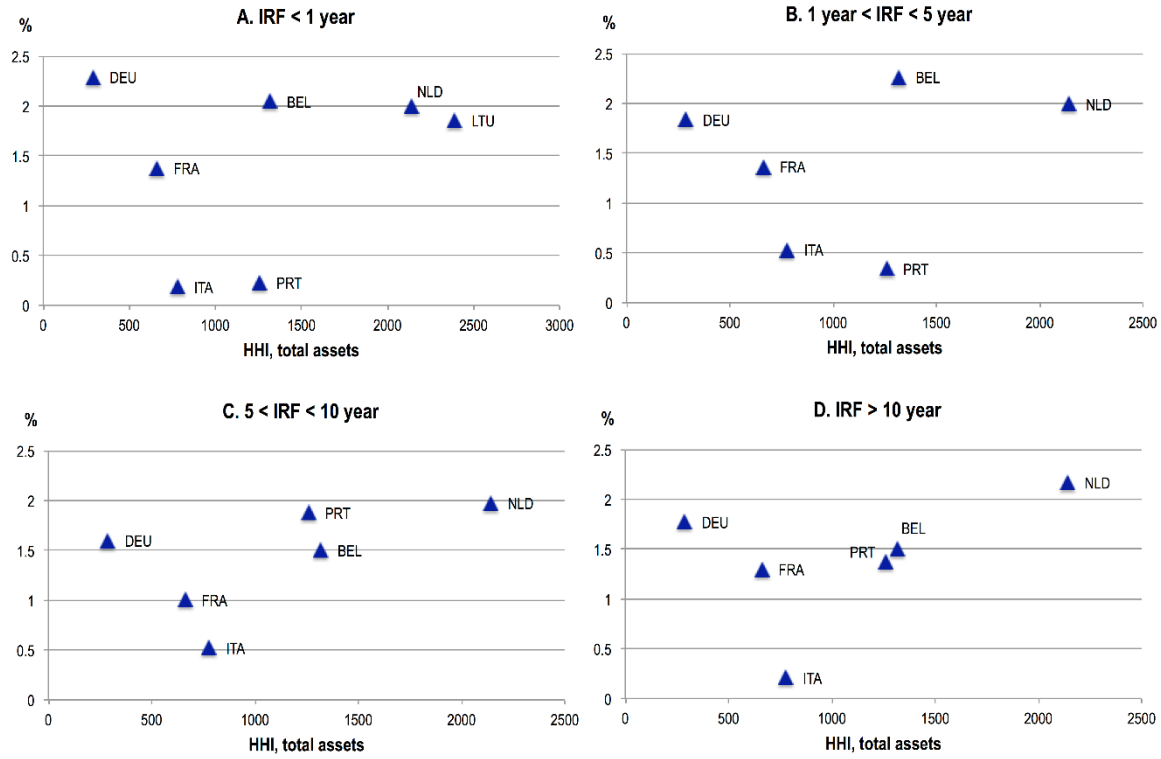
Source: ECB Statistical Data Warehouse

Figure B.13: Robustness: price-concentration year 2020



Source: ECB Statistical Data Warehouse

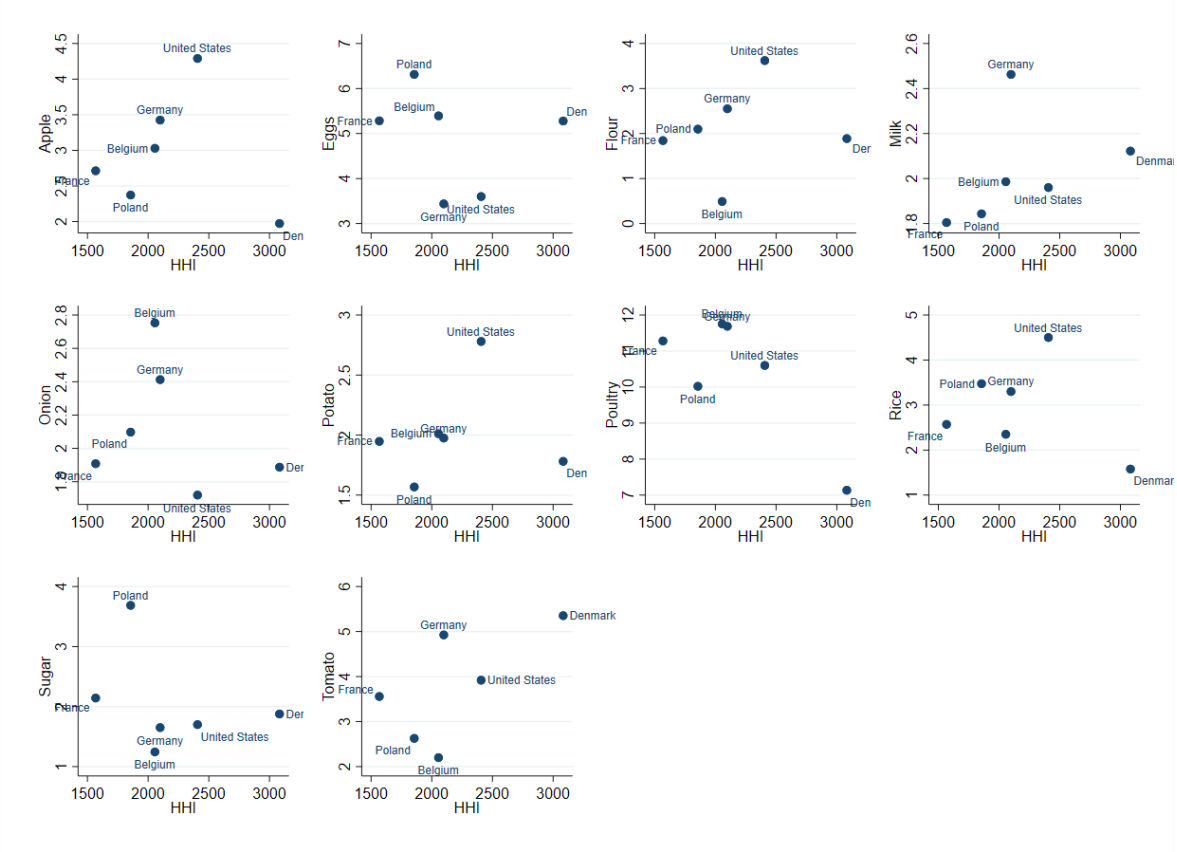
Figure B.14: Price-concentration graphs, mortgage rates-bond yield spreads, 2021



Source: ECB Statistical Data Warehouse

B.6 Modern consumer retail

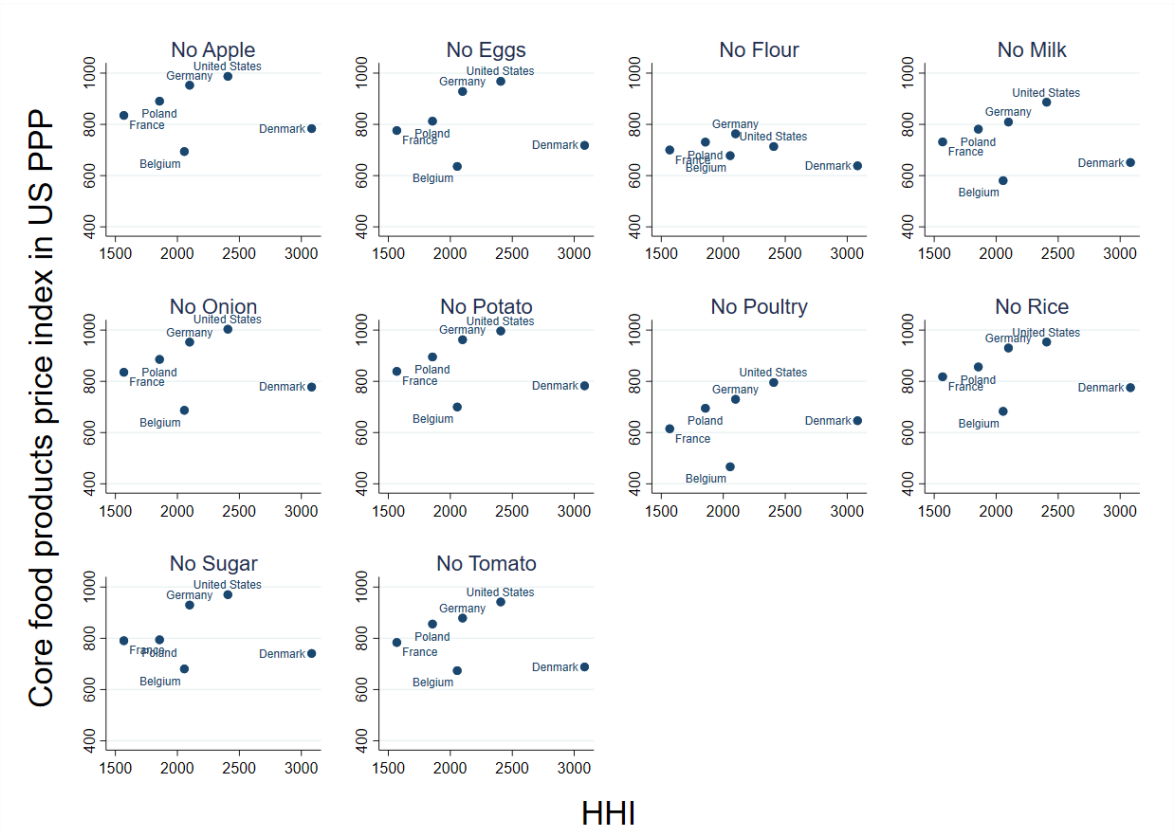
Figure B.15: Relationship between July 2023 good prices in PPP and HHI at country level[358]



Source: Project Team based on www.globalproductprices.com , https://www.esmmagazine.com and the Purchasing Power Parity from OECD database

[358] *Figure B.15 shows the relationship between June 2023 specific food prices and HHI in Belgium, Denmark, France, Germany, Poland and the US. Market concentration is measured as the sum of the squared sale shares of each produce the top retailers. Food price are collected from the website www.globalproductprices.com. Market concentration comes from Project Team calculations on the sales information from https://www.esmmagazine.com/.*

Figure B.16: Relationship between leave-one-out price index in PPP and HHI at country level[359]



Source: Project Team based on www.globalproductprices.com , https://www.esmmagazine.com and the Purchasing Power Parity from OECD database

[359] *Figure B.16 shows the relationship between June 2023 specific food prices and HHI in Belgium, Denmark, France, Germany, Poland and the US. Market concentration is measured as the sum of the squared sale shares of each produce the top retailers. Food price are collected from the website www.globalproductprices.com. Market concentration comes from Project Team calculations on the sales information from https://www.esmmagazine.com/.*

Annex C Global Superstars: annexes

C.1 Methodology

The Global Superstars are selected from the Fortune Global 500 dataset. The dataset is imported and processed using Stata (a statistical software). In this section, we explain how the dataset was prepared for the analysis.

Since the analysis is mainly based on the estimation of five-year averages of relevant metrics (e.g. profit, profit rate, market value), the main goal of the data processing is to produce a dataset where firms are treated consistently over time and trackable as one consolidated "unit" in each five-year period. For this reason, three main steps are implemented: cleaning of company names, treatment of firms with missing entries and consolidation of the information on economic sectors.

C.1.1 Cleaning of company names

The "cleaning" of company names is necessary for different reasons. For some entries, the names assigned to companies are changed because there is a typo, or the name contains some words or characters that will potentially cause problems in the data analyses. Firm naming problems are addressed in the following steps:

- Legal entity terms are removed from all company names (e.g., "GmbH", "INC", "N.V." and "SPRL").
- Accents are removed from company names (e.g., "Électricité de France" becomes "Electricite de France").
- Miscellaneous naming problems are fixed. Inconsistently applied acronyms and abbreviations are made consistent, and typos are fixed.

Sometimes, names are changed because it is necessary to do so for the firm level analyses. We want to produce five-year estimates even when a company changes its name within a five-year period. There are two reasons for name changes: a firm decides to rename or rebrand itself (e.g., Google changed its name to Alphabet in 2016), or the name changes following merger and acquisition activity (e.g., Exxon and Mobil merged in 1999 and became ExxonMobil). A decision is made on which company name is used throughout the period. This avoids duplication of companies in the ranking and ensures that the composite index of each firm is correctly calculated. For example, the name Alphabet is assigned to all entries corresponding to Google or Alphabet. This allows us to treat the firm as one unit over all five-year periods 2008-2012, 2013-2017 and 2018-2022. Following the same logic, the name ExxonMobil is assigned to the entries "Exxon" and "ExxonMobil" that otherwise would appear as two separate entries for the period 1998-2002 (since the merger occurred in 1999, Fortune Global 500 contains "Exxon" for the years 1998 and 1999, and "ExxonMobil" for years 2000, 2001 and 2002.)

C.1.2 Treatment of missing entries

The Fortune Global 500 database is restricted to the top 500 firms by revenue. Therefore, data is not available for a firm in a given year if it does not belong to the 500 largest companies in that year. Since our main analysis considers five-year periods, we have to define how we treat firms that appear in some, but not all years within a given five-year period.

The focus of the study is on firms with consistently large revenue. Hence, a firm that only appears in one or two years out of five should not be defined as a Global Superstar. Equally, only considering firms that appear in all 5 years is a strong selection criterion.

Considering this trade-off, we apply the following rule:

1. All firms with fewer than three entries per five-year period are dropped from the analysis of that period. This results in 1238 of the 14,000 entries in the 1994 to 2022 Fortune Global 500 database being dropped.
2. Firms with three appearances in a given five-year period and fewer than 20 appearances in the whole 1998-2022 period are dropped from the analysis of that specific five-year period. This results in 831 entries being dropped.

These conditions mean that, generally, a firm needs to appear in at least four out of five years within a given five-year period to be a candidate Global Superstar. But an exception is made for firms with only three appearances, if they otherwise appear in almost all years within the whole observation period.

C.1.3 Consolidation of the information on sector of activities

The Fortune Global 500 dataset contains information on the economic sectors in which firms operate. Since this information is available on an annual basis in the dataset, while our main analysis is focused on five-year periods, it can happen that a firm is assigned to two different economic sectors within the same five-year period, if a firm changes its main area of activity. To make sure that the analysis made at the level of the economic sectors in section 3.3.4 is consistent, we consolidate the sector classification within five-year periods. This means that, when two different sectors are assigned to the same firm within the same five-year period, only one of the two sectors is kept. The rule adopted is to keep the sector with the highest number of entries in that five-year period for that firm (e.g., when a sector has at least 3 entries over the five-year period).

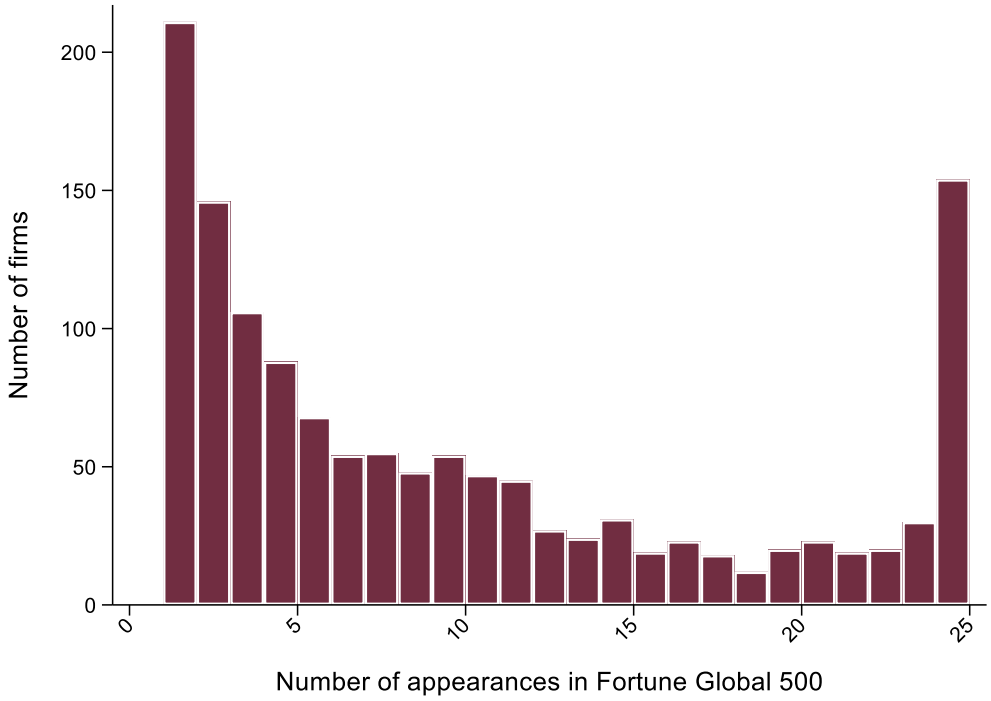
This rule is applied only to Global Superstars and affects a total of 10 firms. This ensures that the analysis in section 3.3.4 on sectors is consistent: since the averages of the key metrics (e.g., profit, profit rate and revenue) are produced over five-year periods, firms assigned to 2 sectors would be counted twice if the analysis was implemented at the sector level and not at the firm level.

C.2 Database: Fortune Global 500

C.2.1 Descriptive statistics

Figure C.1 shows the distribution of the number of appearances of firms in the Fortune Global 500 database. This graph is based on the original company names from Fortune Global 500, not the consolidated company names that the Global Superstar lists are based on. A higher bar means that a greater number of firms have appeared in the Fortune Global 500 the number of times described in the horizontal axis, for example the first bar on the left of the graph shows that more than 200 firms have made one appearance in the Fortune Global 500 from 1998 to 2022 and the last bar on the right shows that over 100 firms appear in every Fortune Global 500 list from 1998 to 2022.

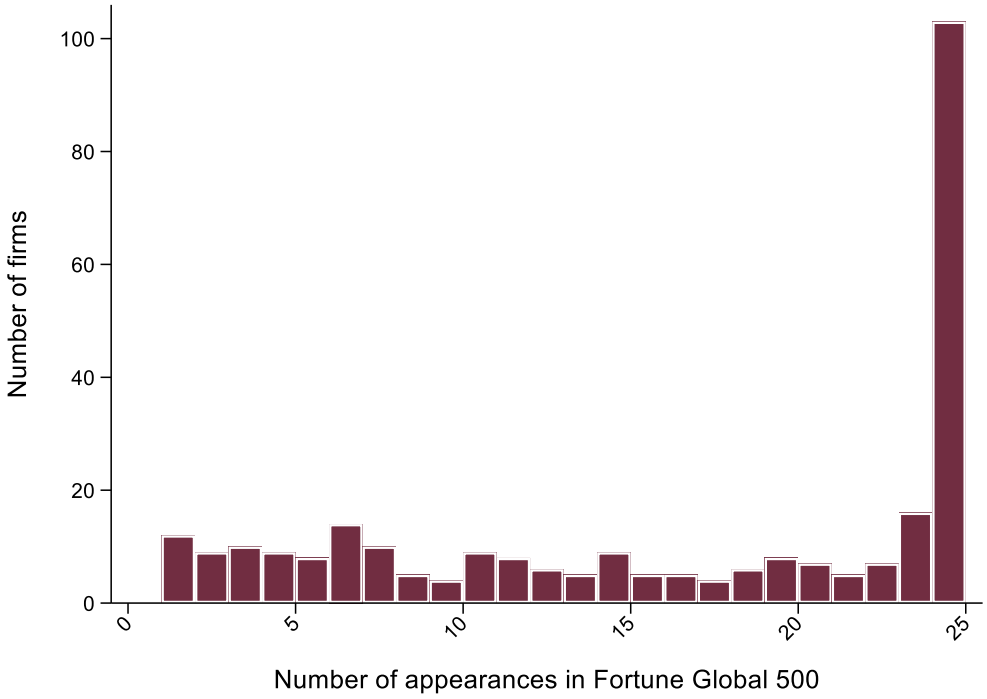
Figure C.1: Distribution of total firm appearances in Fortune Global 500, 1998-2022



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure C.2 shows the distribution of the total number of appearances in the Fortune Global 500 database for firms that have been one of the top 100 firms by revenue in the Fortune Global 500 at least once between 1998 and 2022.

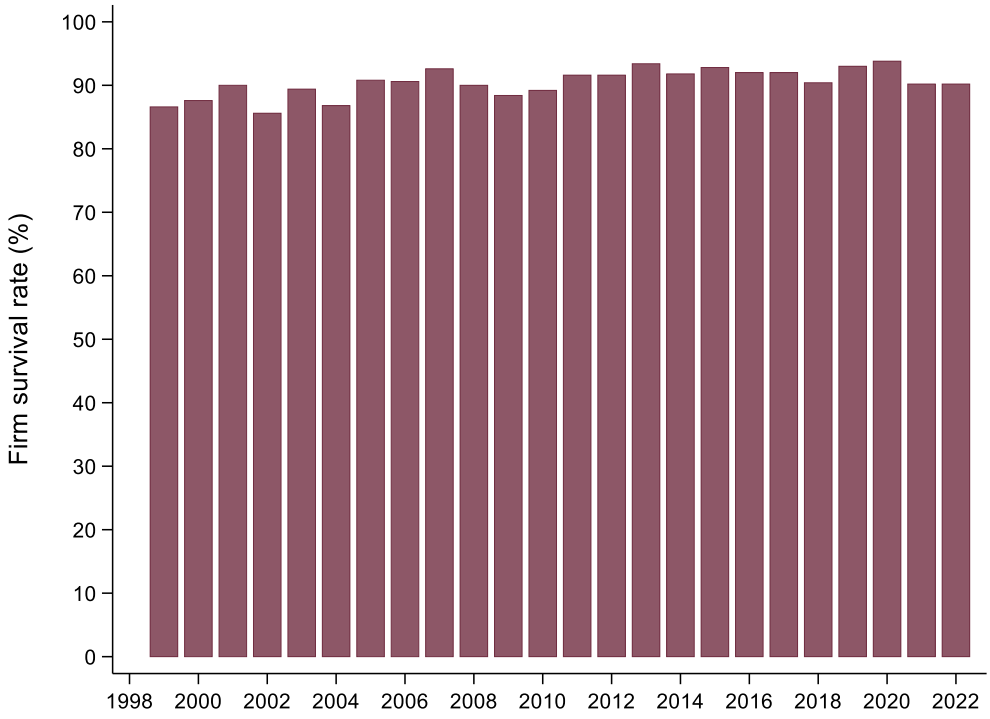
Figure C.2: Distribution of top 100 firm appearances in Fortune Global 500, 1998-2022



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure C.3 shows the percentage of firms in each year of the Fortune Global 500 that was also in the Fortune Global 500 in the previous year. This graph is based on the original company names provided by Fortune Global 500, not the consolidated company names that the Global Superstars lists are based on. The graph demonstrates that in each Fortune 500 Global list from 1999 to 2022, most firms that appear on the list in a given year were also in the previous year's list. This also demonstrates that the composition of the Fortune Global 500 is relatively stable from 1998 to 2022.

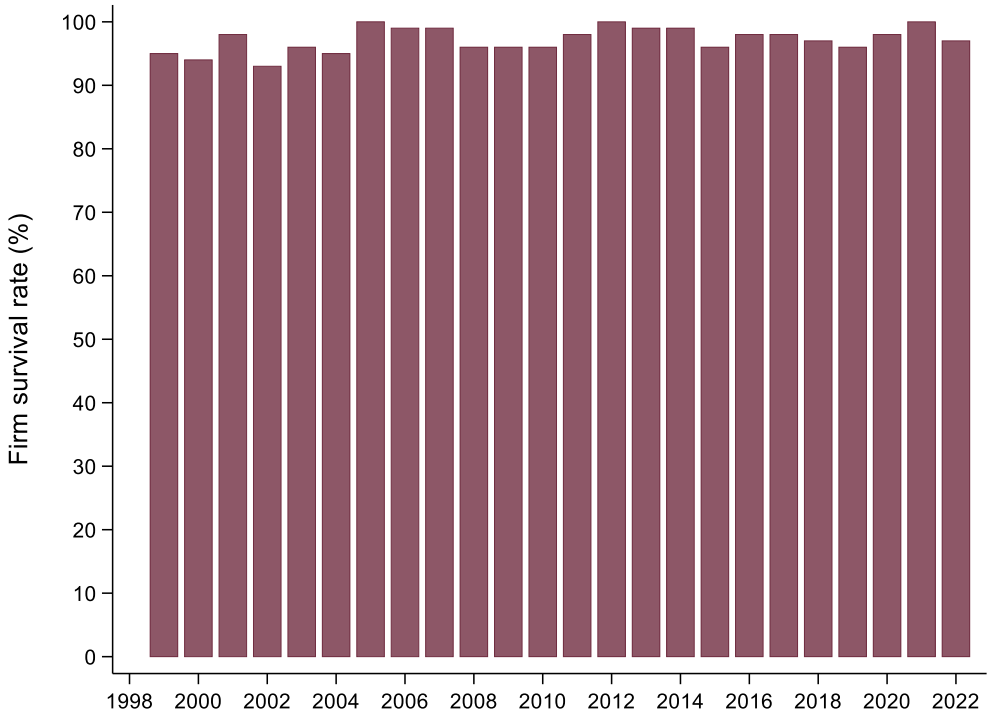
Figure C.3: Firm survival rate in the Fortune Global 500



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Figure C.4 shows the percentage of the top 100 firms by revenue in the Fortune Global 500 in each year that were also in the 500 firms by revenue in the previous year. Comparing this figure to Figure C.3 shows that the stability of the composition of the Fortune Global 500 is even greater for the largest firms in the Fortune Global 500.

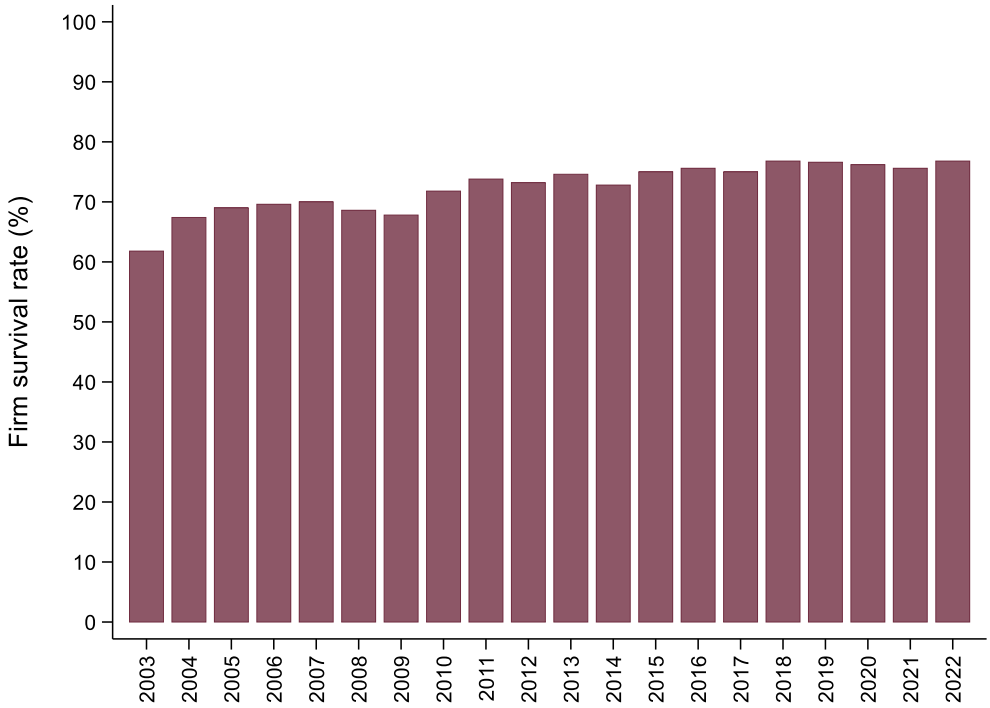
Figure C.4: Top quintile Firm survival rate in the Fortune Global 500



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

To conclude, Figure C.5 shows the five-year firm survival rate over time for all firms in the Fortune Global 500. The rate decreases with respect to the previous graphs, with an average five-year survival rate of 70%. In this perspective, the Fortune Global 500 database stability is lower. However, the rate is not considered to be too low and allows to run the analysis on Global Superstars consistently.

Figure C.5: Five-year firm survival rate in the Fortune Global 500



Source: Project Team based on Fortune Global 500. Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

C.2.2 Comparison with 2023

Table C.1 compares average profit and revenue in years 2019-2022 with the profit and revenue contained in the Fortune Global 500 dataset of 2023 for the full dataset and for Global Superstars only.

Table C.1: Comparison of revenue, profit and profit rate for full Fortune Global 500 and Global Superstars for years 2019-2023

	Year	*Revenue (mean, Billion USD)*	*Profit (mean, Billion USD)*	*Profit rate (mean, %)*
Full dataset	2019	69.0	4.6	6.6
	2020	70.8	4.5	5.9
	2021	68.7	3.7	5.2
	2022	82.2	6.9	8.2
	2023	81.9	5.8	6.8
Global Superstars only	2019	78.7	13.9	17.8
	2020	81.1	13.3	16.8
	2021	81.1	14.2	19.0
	2022	95.4	19.6	20.2
	2023	101.8	18.8	17.3

Note: In Fortune Global 500, the year information refers to the year in which the data was collected. This means that the data refers to the previous fiscal year. For instance, data collected in year 2022 refers to fiscal year 2021, while data of year 2023 refers to fiscal year 2022. Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

C.3 Global Superstars – additional rankings

C.3.1 The 30 largest firms by absolute profit

Table C.2 lists the 30 largest firms by absolute profit in each five-year period between 1998 and 2022.

Table C.2: The 30 largest firms by profit

Rank	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
1	ExxonMobil	ExxonMobil	ExxonMobil	Apple	Saudi Aramco
2	Shell	Shell	Gazprom	ExxonMobil	Apple
3	Philip Morris	BP	Shell	Samsung Electronics	Alphabet
4	IBM	Total	Chevron	Gazprom	Microsoft
5	Ford Motor	Toyota Motor	Microsoft	Vodafone	Samsung Electronics
6	Microsoft	Chevron	Petrobras	Microsoft	Meta
7	BP	Philip Morris	Petronas	Toyota Motor	Toyota Motor
8	Intel	Pfizer	BP	Walmart	Verizon
9	Merck	Gazprom	Nestle	Alphabet	Tencent
10	SBC Communications	Microsoft	Total	Johnson and Johnson	Intel

11	AT&T	Walmart	Walmart	Chevron	Gazprom
12	Walmart	China National Petroleum	BHP	IBM	British American Tobacco
13	Daimler	Petronas	Vale	Shell	Pfizer
14	Verizon	Johnson and Johnson	IBM	China National Petroleum	Amazon
15	Dupont	Eni	China National Petroleum	Pfizer	AT&T
16	Johnson and Johnson	ConocoPhillips	AT&T	Volkswagen	Alibaba
17	Eni	GlaxoSmithKline	Procter and Gamble	AT&T	TSMC
18	General Motors	Petrobras	Johnson and Johnson	Nestle	Comcast
19	Novartis	IBM	Vodafone	Intel	Volkswagen
20	Bristol-Myers Squibb	Samsung Electronics	Telefonica	Novartis	UnitedHealth
21	Pfizer	Procter and Gamble	Apple	Verizon	Johnson and Johnson
22	GlaxoSmithKline	Intel	Rosneft Oil	Petronas	Novartis
23	Toyota Motor	Merck	China Mobile Communications	Roche	Roche
24	PDVSA	Eon	Eni	China Mobile Communications	China Mobile Communications
25	Philips	Novartis	Novartis	Procter and Gamble	Nestle
26	Procter and Gamble	Nestle	Samsung Electronics	Oracle	Rio Tinto
27	Total	Verizon	LUKOIL	State Grid	Home Depot
28	BellSouth	Home Depot	Volkswagen	Rosneft Oil	Walmart
29	Cable and Wireless	BHP	Pfizer	Cisco Systems	Procter and Gamble
30	Coca-Cola	LUKOIL	Roche	Daimler	ExxonMobil

Source: Project Team- Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

C.3.2 The 30 firms with the highest profit rate

Table C.3 lists the 30 firms with the highest profit rate in each five-year period between 1998 and 2022.

Table C.3: The 30 firms with the highest profit rate

Rank	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
1	Microsoft	Microsoft	Vale	Vodafone	British American Tobacco
2	Cable and Wireless	Petronas	Microsoft	Oracle	TSMC
3	Eli Lilly	Gazprom	Philip Morris	Philip Morris	Meta
4	Intel	Merck	Occidental Petroleum	Qualcomm	Tencent
5	Petronas	Pfizer	BHP	Hutchison Whampoa	Pfizer
6	GlaxoSmithKline	GlaxoSmithKline	Alphabet	Apple	SK hynix
7	Bristol-Myers Squibb	Novartis	Gazprom	Pfizer	Microsoft
8	Novartis	Coca-Cola	Rosneft Oil	Microsoft	Saudi Aramco

9	Pfizer	National Grid	Oracle	Alphabet	Rio Tinto
10	Merck	Johnson and Johnson	Surgutneftegas	Johnson and Johnson	Philip Morris
11	LUKOIL	AstraZeneca	AstraZeneca	Intel	Intel
12	Abbott	BHP	Coca-Cola	Novartis	Novartis
13	Coca-Cola	Cisco Systems	Petronas	Roche	Oracle
14	Telstra	Wyeth	Merck	Cisco Systems	Apple
15	Anglo American	Intel	Novartis	McDonald's	Alphabet
16	Johnson and Johnson	Eli Lilly	British American Tobacco	AB InBev	Alibaba
17	BellSouth	China Mobile Communications	Anglo American	Twenty-First Century Fox	Roche
18	Roche	Telstra	Oil and Natural Gas	GlaxoSmithKline	Coca-Cola
19	Dupont	Petrobras	Intel	Coca-Cola	Sanofi
20	SBC Communications	Philip Morris	Johnson and Johnson	3M	Abbvie
21	McDonald's	BellSouth	Roche	Gazprom	Cisco Systems
22	AstraZeneca	LUKOIL	Cisco Systems	IBM	SAP
23	Anheuser-Busch	3M	TNK-BP	Walt Disney	Vale
24	Philip Morris	L'Oreal	Apple	Telstra	Merck
25	Nokia	PepsiCo	McDonald's	L'Oreal	Verizon
26	Petrobras	Anheuser-Busch	GlaxoSmithKline	Merck	Procter and Gamble
27	Minnesota Mining and Mfg	Abbott	Akzo Nobel	Sabic	3M
28	Enel	China National Petroleum	Schlumberger	AstraZeneca	BHP
29	Kimberly-Clark	Posco	America Movil	Procter and Gamble	Johnson and Johnson
30	Eni	British American Tobacco	Sanofi	Time Warner	Comcast

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

C.3.3 The 50 Global Superstar - Entry and exit

Table C.4 shows how often a company appears in the list of Global Superstars and depicts entry and exit to/from the list of the Global Superstars. A ✔ signifies that the firm is a Global Superstar in the given period, a ⊖ signifies that a firm is not. The companies in this table are sorted first by number of appearances in the list of Global Superstars, and second by then by name in alphabetical order. The table contains all firms that appear in the list of Global Superstars at least twice.

Table C.4: Entry and exit of firms from the list of Global Superstar

Company	*Appearances*	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
Coca-Cola	5	✔	✔	✔	✔	✔
Intel	5	✔	✔	✔	✔	✔
Johnson and Johnson	5	✔	✔	✔	✔	✔
Merck	5	✔	✔	✔	✔	✔
Microsoft	5	✔	✔	✔	✔	✔
Nestle	5	✔	✔	✔	✔	✔

Novartis	5	✔	✔	✔	✔	✔
Pfizer	5	✔	✔	✔	✔	✔
Philip Morris	5	✔	✔	✔	✔	✔
Procter and Gamble	5	✔	✔	✔	✔	✔
Roche	5	✔	✔	✔	✔	✔
AT&T	4	✔	⊖	✔	✔	✔
Anglo American	4	✔	✔	✔	⊖	✔
AstraZeneca	4	✔	✔	✔	✔	⊖
Chevron	4	✔	✔	✔	✔	⊖
China Mobile Communications	4	⊖	✔	✔	✔	✔
Cisco Systems	4	⊖	✔	✔	✔	✔
ExxonMobil	4	✔	✔	✔	✔	⊖
Gazprom	4	⊖	✔	✔	✔	✔
GlaxoSmithKline	4	✔	✔	✔	✔	⊖
IBM	4	✔	✔	✔	✔	⊖
PepsiCo	4	✔	✔	⊖	✔	✔
Petronas	4	✔	✔	✔	✔	⊖
Toyota Motor	4	✔	✔	⊖	✔	✔
3M	3	⊖	✔	⊖	✔	✔
Abbott	3	✔	✔	✔	⊖	⊖
Alphabet	3	⊖	⊖	✔	✔	✔
Apple	3	⊖	⊖	✔	✔	✔
BHP	3	⊖	✔	✔	⊖	✔
BP	3	✔	✔	✔	⊖	⊖
British American Tobacco	3	⊖	✔	✔	⊖	✔
L'Oreal	3	⊖	✔	⊖	✔	✔
LUKOIL	3	✔	✔	✔	⊖	⊖
McDonald's	3	✔	⊖	✔	✔	⊖
Oracle	3	⊖	⊖	✔	✔	✔
Petrobras	3	✔	✔	✔	⊖	⊖
Samsung Electronics	3	⊖	✔	⊖	✔	✔
Sanofi	3	⊖	⊖	✔	✔	✔
Shell	3	✔	✔	✔	⊖	⊖
Telstra	3	✔	✔	⊖	✔	⊖
Total	3	✔	✔	✔	⊖	⊖
Unilever	3	✔	⊖	⊖	✔	✔
Verizon	3	✔	⊖	⊖	✔	✔
Anheuser-Busch	2	✔	✔	⊖	⊖	⊖
BT	2	⊖	✔	⊖	✔	⊖
BellSouth	2	✔	✔	⊖	⊖	⊖
Bristol-Myers Squibb	2	✔	✔	⊖	⊖	⊖
China National Petroleum	2	⊖	✔	✔	⊖	⊖

Comcast	2	⊖	⊖	⊖	✔	✔
ConocoPhillips	2	⊖	✔	⊖	⊖	✔
Eli Lilly	2	✔	✔	⊖	⊖	⊖
Eni	2	✔	✔	⊖	⊖	⊖
Honeywell	2	⊖	⊖	⊖	✔	✔
Mondelez	2	⊖	⊖	⊖	✔	✔
Nokia	2	✔	✔	⊖	⊖	⊖
Rio Tinto	2	⊖	⊖	✔	⊖	✔
Rosneft Oil	2	⊖	⊖	✔	✔	⊖
Sabic	2	⊖	⊖	✔	✔	⊖
Softbank	2	⊖	⊖	⊖	✔	✔
Vale	2	⊖	⊖	✔	⊖	✔
Vodafone	2	⊖	⊖	✔	✔	⊖
Walmart	2	✔	✔	⊖	⊖	⊖

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

C.3.4 The 50 Global Superstars – alternative definitions

Table C.5 lists the 50 Global Superstars (as defined in section 3.2.3) when financial firms are included in the rankings.

Table C.5: The 50 Global Superstars - including financial firms

Rank	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
1	Microsoft	Microsoft	Gazprom	Industrial and Commercial Bank Of China	Saudi Aramco
2	General Electric	ExxonMobil	Vale	Apple	British American Tobacco
3	Intel	Citigroup	Microsoft	China Construction Bank	Apple
4	ExxonMobil	Bank Of America	Industrial and Commercial Bank Of China	Fannie Mae	Industrial and Commercial Bank Of China
5	Citigroup	Gazprom	ExxonMobil	Agricultural Bank Of China	Berkshire Hathaway
6	Merck	Petronas	China Construction Bank	Bank Of China	Microsoft
7	Cable and Wireless	Pfizer	BHP	Vodafone	Meta
8	Philip Morris	GlaxoSmithKline	Petronas	Wells Fargo	China Construction Bank
9	GlaxoSmithKline	US Bancorp	Bank Of China	JP Morgan Chase	JP Morgan Chase
10	Eli Lilly	General Electric	Rosneft Oil	Oracle	Alphabet
11	Bristol-Myers Squibb	Johnson and Johnson	Philip Morris	Microsoft	TSMC
12	Novartis	Merck	Alphabet	Freddie Mac	Tencent
13	Pfizer	HSBC	Petrobras	Philip Morris	Agricultural Bank Of China
14	Bank Of America	Philip Morris	Occidental Petroleum	Alphabet	Bank Of America
15	Petronas	Wells Fargo	Nestle	Hutchison Whampoa	Bank Of China
16	SBC Communications	Novartis	AstraZeneca	Pfizer	Pfizer
17	Shell	Shell	Johnson and Johnson	Johnson and Johnson	Intel

18	IBM	Petrobras	Coca-Cola	Qualcomm	Sberbank
19	HSBC	Coca-Cola	Novartis	Gazprom	Rio Tinto
20	Lloyds Banking	Intel	Oracle	China Merchants Bank	SK hynix
21	Johnson and Johnson	BHP	Shell	Royal Bank Of Canada	Samsung Electronics
22	Dupont	National Grid	Surgutneftegas	Intel	Novartis
23	Coca-Cola	Wachovia	Apple	Bank Of Communications	China Merchants Bank
24	AT&T	China National Petroleum	Chevron	Novartis	Alibaba
25	Ford Motor	Cisco Systems	Bank Of Communications	Roche	Philip Morris
26	BP	AstraZeneca	Merck	Bank Of Nova Scotia	Oracle
27	American International	Royal Bank Of Scotland	Intel	Toronto-Dominion Bank	Wells Fargo
28	BellSouth	China Mobile Communications	Agricultural Bank Of China	Cisco Systems	Verizon
29	LUKOIL	BP	Roche	Shanghai Pudong Development Bank	Toronto-Dominion Bank
30	Abbott	Mizuho Financial	Procter and Gamble	Samsung Electronics	US Bancorp
31	Fannie Mae	Washington Mutual	Vodafone	ExxonMobil	Royal Bank Of Canada
32	Ing	Wyeth	IBM	IBM	Roche
33	Eni	American International	China Mobile Communications	Mizuho Financial	Commonwealth Bank Of Australia
34	Verizon	Banco Bilbao Vizcaya Argentaria	JP Morgan Chase	AB InBev	Goldman Sachs
35	Morgan Stanley	Eli Lilly	Cisco Systems	Goldman Sachs	Industrial Bank
36	Anglo American	LUKOIL	Anglo American	Berkshire Hathaway	Morgan Stanley
37	Telstra	China Construction Bank	GlaxoSmithKline	Industrial Bank	Bank Of Communications
38	Roche	Telstra	TNK-BP	Mitsubishi Ufj Financial	Johnson and Johnson
39	Wells Fargo	Eni	British American Tobacco	Commonwealth Bank Of Australia	Bank Of Nova Scotia
40	PDVSA	Barclays	Telefonica	China Minsheng Banking	Gazprom
41	Barclays	Total	General Electric	Sberbank	Comcast
42	Philips	Berkshire Hathaway	Pfizer	Westpac Banking	Coca-Cola
43	Ubs	Procter and Gamble	Oil and Natural Gas	GlaxoSmithKline	Sanofi
44	Washington Mutual	BellSouth	Sanofi	McDonald's	Procter and Gamble
45	Procter and Gamble	Nordea Bank	Wells Fargo	Coca-Cola	Cisco Systems
46	Walmart	PepsiCo	Rio Tinto	Australia and New Zealand Banking	Abbvie
47	AstraZeneca	Samsung Electronics	Total	Twenty-First Century Fox	Citigroup
48	Enel	Goldman Sachs	Goldman Sachs	Citigroup	Shanghai Pudong Development Bank
49	Petrobras	Toyota Motor	America Movil	Sumitomo Mitsui Financial	Capital One Financial
50	McDonald's	Merrill Lynch	McDonald's	HSBC	Merck

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Table C.6 lists the 50 Global Superstars when using an alternative composite index that includes revenue as a third component (in addition to profit and profit rate as the main composite index).

Table C.6: Top 50 by a composite index including profit, profit rate and revenue

Rank	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
1	ExxonMobil	ExxonMobil	ExxonMobil	Apple	Saudi Aramco
2	Microsoft	Shell	Gazprom	ExxonMobil	Apple
3	Ford Motor	BP	Shell	Vodafone	British American Tobacco
4	Shell	Microsoft	Walmart	Walmart	Walmart
5	Walmart	Walmart	Vale	Microsoft	Microsoft
6	General Motors	Gazprom	Microsoft	Gazprom	Alphabet
7	Intel	Pfizer	BP	Oracle	Meta
8	IBM	Petronas	Chevron	Samsung Electronics	Samsung Electronics
9	BP	Toyota Motor	Petronas	Alphabet	Toyota Motor
10	Philip Morris	GlaxoSmithKline	BHP	Johnson and Johnson	TSMC
11	Daimler	Philip Morris	Petrobras	Philip Morris	Tencent
12	Merck	Total	Nestle	Pfizer	State Grid
13	SBC Communications	Johnson and Johnson	Total	Shell	Amazon
14	Cable and Wireless	Chevron	Rosneft Oil	Toyota Motor	Pfizer
15	AT&T	Merck	China National Petroleum	Hutchison Whampoa	Intel
16	GlaxoSmithKline	China National Petroleum	Philip Morris	China National Petroleum	Sinopec
17	Bristol-Myers Squibb	Novartis	Johnson and Johnson	Qualcomm	Verizon
18	Toyota Motor	Petrobras	Alphabet	Intel	Volkswagen
19	Novartis	Intel	IBM	Novartis	China National Petroleum
20	Pfizer	Eni	Occidental Petroleum	IBM	Shell
21	Eli Lilly	Coca-Cola	Novartis	Roche	UnitedHealth
22	Petronas	ConocoPhillips	Procter and Gamble	State Grid	Alibaba
23	Johnson and Johnson	BHP	Coca-Cola	Cisco Systems	Rio Tinto
24	Dupont	Cisco Systems	Apple	Volkswagen	Novartis
25	Verizon	China Mobile Communications	AstraZeneca	Sinopec	AT&T
26	Eni	AstraZeneca	Vodafone	AB InBev	ExxonMobil
27	Coca-Cola	National Grid	AT&T	Chevron	SK hynix
28	BellSouth	Samsung Electronics	Oracle	Coca-Cola	Gazprom
29	PDVSA	IBM	China Mobile Communications	GlaxoSmithKline	Oracle
30	Philips	Procter and Gamble	Telefonica	Nestle	Comcast
31	Total	LUKOIL	Roche	Procter and Gamble	Roche
32	Procter and Gamble	Wyeth	Merck	AT&T	Philip Morris
33	LUKOIL	Eli Lilly	Surgutneftegas	McDonald's	Johnson and Johnson
34	Chevron	Daimler	Intel	Twenty-First Century Fox	Daimler
35	Abbott	Eon	Cisco Systems	BP	Cvs Health
36	Siemens	Telstra	Eni	Petronas	China Mobile Communications

37	Nestle	PepsiCo	Pfizer	Walt Disney	Nestle
38	Anglo American	Nestle	GlaxoSmithKline	China Mobile Communications	Procter and Gamble
39	Roche	Verizon	Sinopec	Verizon	Home Depot
40	Telstra	BellSouth	Volkswagen	Merck	Cisco Systems
41	Eon	3M	TNK-BP	Rosneft Oil	Huawei
42	Mitsubishi	Nokia	Anglo American	3M	Softbank
43	Mitsui	Home Depot	LUKOIL	Daimler	Sanofi
44	Unilever	Honda Motor	Sanofi	Total	Coca-Cola
45	Hewlett-Packard	Nippon Telegraph and Telephone	Rio Tinto	Comcast	Abbvie
46	Enel	Abbott	Samsung Electronics	Sabic	Total
47	Tyco International	L'Oreal	British American Tobacco	L'Oreal	China State Construction Engineering
48	Petrobras	Anglo American	Oil and Natural Gas	Telstra	Merck
49	Nokia	Nissan Motor	America Movil	Sanofi	Vale
50	AstraZeneca	BT	Toyota Motor	General Motors	BHP

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

Table C.7 lists the 50 Global Superstars when removing outliers. For this exercise, for each firm and within each five-year period, the observation with the highest and lowest profit rate are removed from the sample.

Table C.7: Top 50 when excluding outliers

Rank	*1998-2002*	*2003-2007*	*2008-2012*	*2013-2017*	*2018-2022*
1	Microsoft	Microsoft	Gazprom	Apple	Saudi Aramco
2	Intel	ExxonMobil	Vale	Microsoft	Meta
3	ExxonMobil	Petronas	ExxonMobil	Oracle	Apple
4	Merck	Gazprom	Microsoft	Philip Morris	Microsoft
5	Shell	Pfizer	BHP	Johnson and Johnson	TSMC
6	Philip Morris	GlaxoSmithKline	Petronas	Alphabet	Tencent
7	SBC Communications	Johnson and Johnson	Alphabet	Gazprom	Alphabet
8	Cable and Wireless	Petrobras	Philip Morris	Qualcomm	Intel
9	Eli Lilly	Merck	Occidental Petroleum	Intel	Pfizer
10	Novartis	Philip Morris	Rosneft Oil	Roche	SK hynix
11	Petronas	Shell	Petrobras	Pfizer	Rio Tinto
12	Bristol-Myers Squibb	Novartis	Johnson and Johnson	ExxonMobil	Oracle
13	GlaxoSmithKline	Coca-Cola	Shell	Cisco Systems	Philip Morris
14	IBM	Intel	Oracle	IBM	Alibaba
15	Pfizer	Cisco Systems	AstraZeneca	Samsung Electronics	British American Tobacco
16	Johnson and Johnson	China Mobile Communications	Vodafone	AB Inbev	Samsung Electronics

17	Coca-Cola	BP	Surgutneftegas	Novartis	Coca-Cola
18	Roche	AstraZeneca	Chevron	McDonald's	Cisco Systems
19	AT&T	Wyeth	Novartis	Coca-Cola	Novartis
20	BellSouth	Eni	GlaxoSmithKline	GlaxoSmithKline	Roche
21	Abbott	Chevron	Coca-Cola	Twenty-First Century Fox	Johnson and Johnson
22	Daimler	LUKOIL	Anglo American	Procter and Gamble	Verizon
23	PDVSA	BellSouth	Intel	Hutchison Whampoa	Procter and Gamble
24	Telstra	BHP	China Mobile Communications	Walt Disney	Abbvie
25	Dupont	China National Petroleum	IBM	BHP	Gazprom
26	LUKOIL	Telstra	Roche	Petronas	BHP
27	Ford Motor	Total	Procter and Gamble	Toyota Motor	Sanofi
28	Cisco Systems	Procter and Gamble	BP	3M	Merck
29	Philips	Eli Lilly	Cisco Systems	Telstra	Sap
30	Eni	Roche	TNK-BP	Nestle	Petronas
31	Walmart	Toyota Motor	Merck	Chevron	ConocoPhillips
32	Procter and Gamble	Abbott	Apple	Sabic	3M
33	Nokia	Samsung Electronics	Telefonica	Verizon	Honeywell
34	Verizon	PepsiCo	Pfizer	China Mobile Communications	Vale
35	Gazprom	3M	British American Tobacco	Comcast	Nestle
36	AstraZeneca	IBM	McDonald's	Rosneft Oil	Comcast
37	McDonald's	Posco	Nestle	Sanofi	AT&T
38	BP	National Grid	Oil and Natural Gas	Time Warner	China Mobile Communications
39	Tyco International	Anheuser-Busch	Sanofi	L'Oreal	Toyota Motor
40	France Telecom	ConocoPhillips	America Movil	AT&T	L'Oreal
41	Anglo American	Eon	AT&T	Merck	Mondelez
42	Enel	Nokia	Eli Lilly	AstraZeneca	Medtronic
43	Hewlett-Packard	Bristol-Myers Squibb	Rio Tinto	PepsiCo	CK Hutchison
44	General Motors	L'Oreal	Total	Honeywell	GlaxoSmithKline
45	BT	British American Tobacco	Sabic	BT	Inditex
46	PepsiCo	BT	Schlumberger	Unilever	Walt Disney
47	Nestle	Royal Kpn	Xstrata	Walmart	Home Depot
48	Minnesota Mining and Mfg	Anglo American	China National Offshore Oil	Lyondellbasell Industries	KDDI
49	Petrobras	Nestle	Abbott	United Technologies	Gree Electric Appliances
50	Anheuser-Busch	Hutchison Whampoa	LUKOIL	Hyundai Motor	Enterprise Products

Source: Project Team - Underlying data provided by Fortune Media (USA) Corporation. Used with permission.

C.4 Sector comparison – additional statistics

For the sector comparison, the data of Fortune Global 500 (on which Global Superstars are defined) is supplemented with data extracted from the ORBIS database, which includes metrics that are not available in Fortune Global 500. The extraction from ORBIS contains about 6,000 global firms, both public and private, with revenues higher than 1 billion EUR (to restrict the analysis to very large corporations), and it is limited to the years 2018-2022[360].

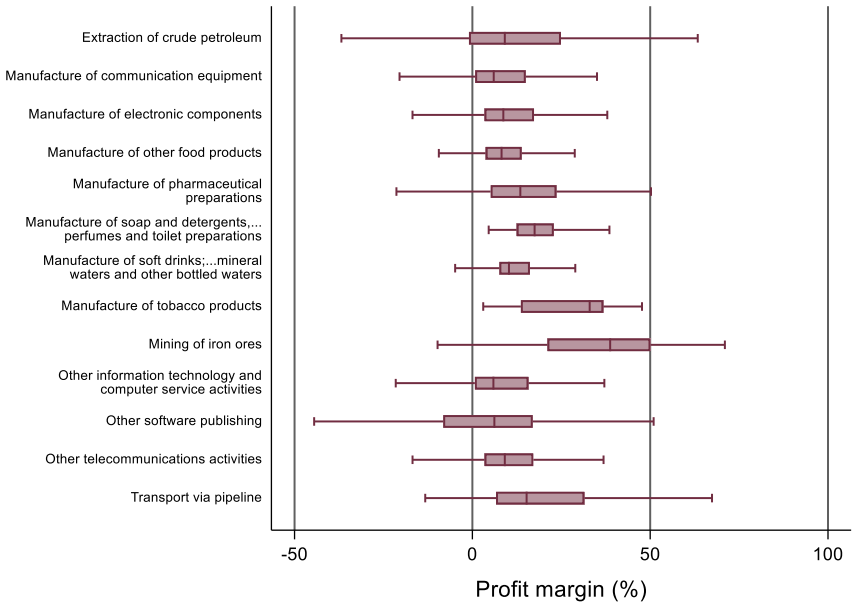
The sector analysis rests on the following procedure: (i) the 50 Global Superstars are identified in the ORBIS dataset, (ii) the sectors in which the 50 Global Superstars operate are identified (by the corresponding NACE code); (iii) based on the selected NACE codes, the parameters of interest are aggregated, both for the Global Superstars and for the other firms in our ORBIS data set.

The figures do not show all sectors in which Global Superstars are active, but a selection of 10 sectors. These 10 sectors are composed of all NACE sectors of the "persistent" Global Superstars (as listed in Table 3.2) plus all NACE sectors of the top 10 Global Superstars 2018-2022 (as listed in Table 3.1). In the figures reported in this section, the red bars represent sector average, while the golden bars represent the subsample of Global Superstars. To facilitate comparisons across graphs, the sectors are reported in alphabetical order.

Figure C.6 depicts profit spread per sector. It not only shows that the profit spread and the median profit vary considerably across sectors, but also that belonging to a "high-margin" sector is not a prerequisite to be a Global Superstar.

[360] *As mentioned in section 3.2.1, in the Fortune Global 500 dataset the information for each year refers to the previous fiscal year (e.g., metrics for year 2022 refers to fiscal year 2021). In the ORBIS dataset instead, this is not the same. The data contained in ORBIS for year 2022 refer to fiscal year 2022. Because of this existing discrepancy, the data in Fortune Global 500 for a specific year is matched to the data of the former year in ORBIS.*

Figure C.6: Sector analysis—Profit spread



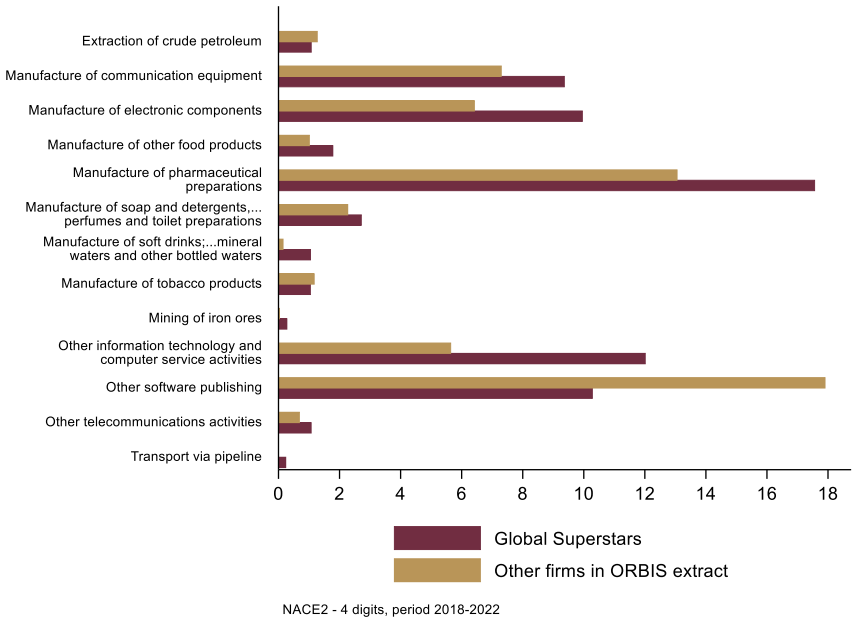
Note: Figure based all firms in the ORBIS extraction, not just the Superstar firms. Outliers are not shown.

Source: Project Team based on ORBIS

Figure C.7 compares research and development (R&D) expenditure by Global Superstars with other large firms of the same sector. First, it shows that there is no common pattern in sectors where Global Superstars are active in terms of R&D expenditure: in some sectors like "Manufacture of Tobacco products" or "Transport via pipeline", R&D spending is relatively small, while in others, such as the pharmaceutical sector (e.g., "Manufacture of pharmaceutical products"), R&D expenditure is much more significant. Second, in most sectors, Global Superstars spend significantly more than other (large)[361] firms in the same sector, both in absolute terms and as a proportion of their sales. The conclusion is twofold: investing in R&D is not a prerequisite to become a Superstar firm, however, at least in some sectors, large R&D expenditure could be a key determinant to become a Global Superstar.

[361] *Our ORBIS extraction is restricted to companies with revenues higher than 1 billion EUR.*

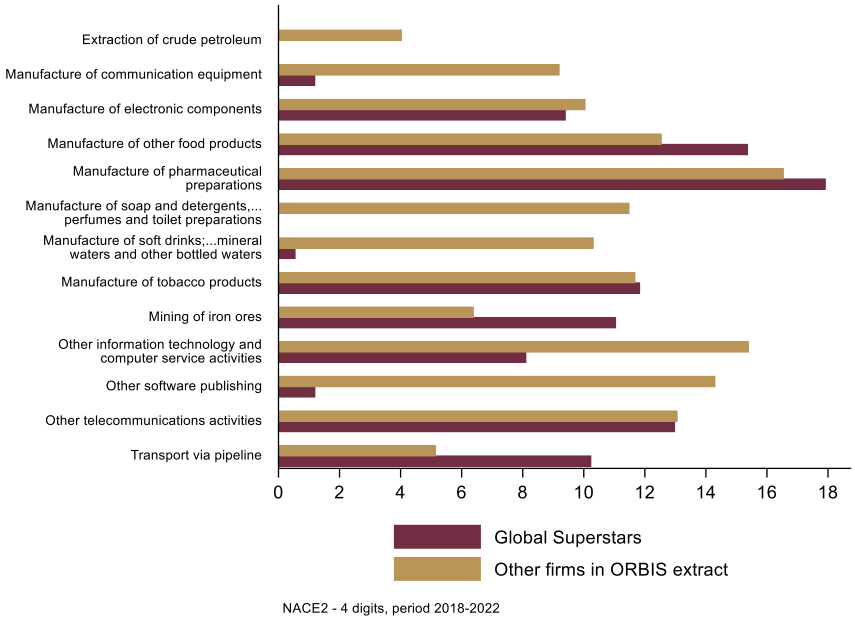
Figure C.7: Sector analysis—R&D expenditures (% of sales)



Source: Project Team based on ORBIS

Figure C.8 depicts labour cost as a percentage of sales. The labour share differs across sectors, but Global Superstars do not depart from their respective sectors in a systematic manner for labour costs: in some sectors there is not much difference between Global Superstars and their sector, while in others they have considerably lower labour costs.

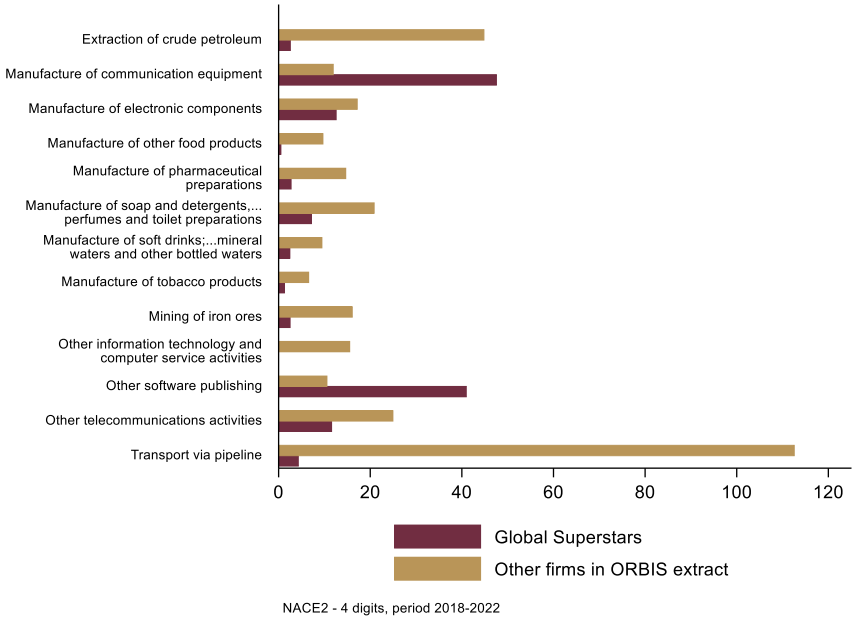
Figure C.8: Sector analysis—Labour cost (% of sales)



Source: Project Team based on ORBIS

Figure C.9 depicts capital cost as a percentage of sales. Again, it is difficult to draw general conclusions of this sector analysis, as Global Superstars do not differ from other large firms in a systematic manner.

Figure C.9: Sector analysis—Capital (% of sales)



Source: Project Team based on ORBIS

Annex D Domestic competition and export performance: annexes

D.1 Most extra-EU exported products, by country and EU level

Table D.1: Top 20 extra-EU exported HS6 products for Austria

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
220210	Waters; including mineral and aerated, containing added sugar or other sweetening matter or flavoured	1	1.34	2.73%
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	2	1.89	3.84%
860400	Railway or tramway maintenance or service vehicles; whether or not self-propelled (e.g. workshops, cranes, ballast tampers, trackliners, testing coaches and track inspection vehicles)	3	0.21	0.44%
842860	Teleferics, chair-lifts, ski-draglines, traction mechanisms for funiculars	4	0.18	0.37%
722592	Steel, alloy; flat-rolled, width 600mm or more, n.e.c. in heading no. 7225, plated or coated with zinc (other than electrolytically)	5	0.30	0.62%
830242	Mountings, fittings and similar articles; suitable for furniture of base metal	6	0.65	1.32%
871130	Motorcycles (including mopeds) and cycles; fitted with an auxiliary motor, reciprocating internal combustion piston engine, of cylinder capacity exceeding 250cc but not exceeding 500cc, with or without side-cars; side-cars	7	0.24	0.50%
300212	Blood, human or animal, antisera, other blood fractions and immunological products; antisera and other blood fractions	8	1.59	3.23%
870530	Vehicles; fire fighting vehicles	9	0.16	0.33%
830210	Hinges; suitable for furniture, doors, staircases, windows, blinds, coachwork, saddlery, trunks, chests, caskets or the like, of base metal	10	0.37	0.76%
381600	Refractory cements, mortars, concretes and similar compositions; other than products of heading no. 3801	11	0.20	0.41%
441011	Particle board of wood, whether or not agglomerated with resins or other organic binding substances	12	0.27	0.55%

903120	Test benches	13	0.17	0.35%
730429	Iron or steel (excluding cast iron or stainless steel); seamless, casing and tubing, of a kind used in drilling for oil or gas	14	0.26	0.53%
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	15	0.53	1.09%
441899	Wood; builders' joinery and carpentry of wood n.e.c. in heading no. 4418, other than of bamboo	16	0.26	0.53%
850220	Electric generating sets; with spark-ignition internal combustion piston engines	17	0.23	0.47%
842839	Elevators and conveyors; continuous-action, for goods or materials, n.e.c. in item no. 8428.20, 8428.31, 8428.32 or 8428.33	18	0.21	0.42%
847780	Machinery; for working rubber or plastics or for the manufacture of products from these materials, n.e.c. in this chapter	19	0.25	0.51%
840734	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 1000cc	20	0.64	1.31%
Total			9.98	20.30%

Source: Project Team based on ITC Trade Map data

Table D.2: Top 20 extra-EU exported HS6 products for Belgium

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
300220	Vaccines; for human medicine	1	23.50	15.17%
710231	Diamonds; non-industrial, unworked or simply sawn, cleaved or bruted, but not mounted or set	2	7.48	4.83%
844630	Weaving machines (looms); for weaving fabrics of a width exceeding 30cm, shuttleless type	3	0.57	0.37%
200410	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen	4	0.96	0.62%
293729	Steroidal hormones, their derivatives and structural analogues; other than cortisone, hydrocortisone, prednisone (dehydrocortisone), prednisolone	5	0.44	0.29%

	(dehydrohydrocortisone), halogenated derivatives of corticosteroidal hormones, oestrogen and progestogens			
871000	Tanks and other armoured fighting vehicles; motorised, whether or not fitted with weapons, and parts of such vehicles	6	0.62	0.40%
440323	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), in the rough, whether or not stripped of bark or sapwood, or roughly squared, untreated, of which any cross-sectional dimension is 15 cm or more	7	0.40	0.26%
180620	Chocolate & other food preparations containing cocoa; in blocks, slabs or bars weighing more than 2kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, content exceeding 2kg	8	0.46	0.29%
300610	Pharmaceutical goods; sterile surgical catgut, suture materials, tissue adhesives, laminaria, laminaria tents, absorbable surgical or dental haemostatics, and surgical or dental adhesion barriers	9	0.40	0.26%
270799	Oils and other products of the distillation of high temperature coal tar; n.e.c. in heading no. 2707	10	1.13	0.73%
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	11	0.62	0.40%
902139	Artificial parts of the body; excluding artificial joints	12	0.71	0.46%
847590	Machines; parts, of those for assembling electric or electronic lamps, tubes, valves or flash-bulbs, in glass envelopes and manufacturing or hot working glass or glassware	13	0.52	0.34%
390931	Amino-resins; n.e.c. in heading no. 3909, in primary forms, poly(methylene phenyl isocyanate) (Crude MDI, polymeric MDI)	14	0.46	0.30%
902131	Artificial parts of the body	15	0.60	0.39%
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	16	1.20	0.78%
300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale	17	12.10	7.81%
293359	Heterocyclic compounds; containing a pyrimidine ring (whether or not	18	0.71	0.46%

	hydrogenated) or piperazine ring in the structure, (other than malonylurea and its derivatives, loprazolam, mecloqualone, methaqualone, zipeprol, and salts thereof) n.e.c. in 2933.5			
300420	Medicaments; containing antibiotics (other than penicillins, streptomycins or their derivatives), for therapeutic or prophylactic uses, packaged for retail sale	19	0.61	0.39%
711011	Metals; platinum, unwrought or in powder form	20	0.40	0.26%
Total			53.89	34.80%

Source: Project Team based on ITC Trade Map data

Table D.3: Top 20 extra-EU exported HS6 products for Czech Republic

HS6 Code	***HS6 Description***	***Rank***	***Value extra EU***	***Share Extra EU export of the country***
711230	Waste and scrap of precious metal or of metal clad with precious metal; ash containing precious metal or precious metal compounds	1	0.62	1.61%
901210	Microscopes (excluding optical microscopes); diffraction apparatus	2	0.34	0.88%
391710	Plastics; artificial guts (sausage casings) of hardened protein or of cellulosic materials	3	0.24	0.63%
930400	Firearms; (e.g. spring, air or gas guns and pistols, truncheons), excluding those of heading no. 9307	4	0.18	0.47%
854720	Insulating fittings; of plastics, for electrical machines, of insulating material only (except minor assembly parts), excluding those of heading no. 8546	5	0.23	0.61%
870321	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity not over 1000cc	6	0.66	1.74%
841330	Pumps; fuel, lubricating or cooling medium pumps for internal combustion piston engines	7	0.40	1.05%
870332	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity over 1500 but not over 2500cc	8	0.74	1.95%
853620	Electrical apparatus; automatic circuit breakers, for a voltage not exceeding 1000 volts	9	0.20	0.53%

870322	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1000 but not over 1500cc	10	1.18	3.09%
842951	Front-end shovel loaders	11	0.23	0.61%
961900	Sanitary towels (pads) and tampons, napkins and napkin liners for babies and similar articles, of any material	12	0.25	0.67%
847150	Units of automatic data processing machines; processing units other than those of item no. 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units	13	1.19	3.11%
853669	Electrical apparatus; plugs and sockets, for a voltage not exceeding 1000 volts	14	0.30	0.78%
847141	Automatic data processing machines; comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined, n.e.c. in item no. 8471.30	15	0.18	0.47%
870380	Vehicles; with only electric motor for propulsion	16	0.54	1.40%
950300	Tricycles, scooters, pedal cars and similar wheeled toys; dolls' carriages; dolls; other toys; reduced-size (scale) models and similar recreational models, working or not; puzzles of all kinds	17	0.80	2.10%
847170	Units of automatic data processing machines; storage units	18	0.71	1.85%
401110	Rubber; new pneumatic tyres, of a kind used on motor cars (including station wagons and racing cars)	19	0.38	1.00%
851220	Lighting or visual signalling equipment; electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)	20	0.21	0.56%
Total			9.58	25.12%

Source: Project Team based on ITC Trade Map data

Table D.4: Top 20 extra-EU exported HS6 products for France

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
220820	Spirits obtained by distilling grape wine or grape marc	1	3.51	1.63%

220410	Wine; sparkling	2	2.65	1.23%
880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15,000kg	3	16.23	7.54%
420221	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of leather or of composition leather	4	3.23	1.50%
220421	Wine; still, in containers holding 2 litres or less	5	4.94	2.30%
621149	Track suits and other garments n.e.c.; women's or girls', of textile materials n.e.c. in item no. 6211.4 (not knitted or crocheted)	6	0.71	0.33%
330300	Perfumes and toilet waters	7	3.08	1.43%
300431	Medicaments; containing insulin, for therapeutic or prophylactic uses, packaged for retail sale	8	1.07	0.50%
880230	Aeroplanes and other aircraft; of an unladen weight exceeding 2000kg but not exceeding 15,000kg	9	1.13	0.53%
420231	Cases and containers; of a kind normally carried in the pocket or in the handbag, with outer surface of leather or of composition leather	10	0.72	0.34%
420222	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of sheeting of plastics or of textile materials	11	1.73	0.80%
330499	Cosmetic and toilet preparations; n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)	12	5.43	2.52%
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	13	1.02	0.47%
880320	Aircraft and spacecraft; under-carriages and parts thereof	14	0.76	0.35%
841112	Turbo-jets; of a thrust exceeding 25kN	15	4.01	1.86%
381121	Lubricating oil additives; containing petroleum oils or oils obtained from bituminous minerals	16	0.80	0.37%
100390	Cereals; barley, other than seed	17	0.87	0.40%
890110	Cruise ships, excursion boats and similar vessels, principally designed for	18	0.85	0.40%

	the transport of persons, ferry boats of all kinds			
841191	Turbines; parts of turbo-jets and turbo-propellers	19	2.85	1.33%
380892	Fungicides; other than containing goods specified in Subheading Note 1 to this Chapter; put up in forms or packings for retail sale or as preparations or articles	20	0.69	0.32%
Total			56.29	26.15%

Source: Project Team based on ITC Trade Map data

Table D.5: Top 20 extra-EU exported HS6 products for Germany

HS6 Code	***HS6 Description***	***Rank***	***Value extra EU***	***Share Extra EU export of the country***
880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15,000kg	1	13.64	2.18%
870340	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, incapable of being charged by plugging to external source of electric power	2	14.88	2.37%
870380	Vehicles; with only electric motor for propulsion	3	8.25	1.32%
842230	Machinery; for filling, closing, sealing, capsuling or labelling bottles, cans, bags or other containers, machinery for aerating beverages	4	1.94	0.31%
870840	Vehicle parts; gear boxes and parts thereof	5	9.45	1.51%
870332	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity over 1500 but not over 2500cc	6	4.23	0.68%
870360	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, capable of being charged by plugging to external source of electric power	7	3.64	0.58%
300212	Blood, human or animal, antisera, other blood fractions and immunological products; antisera and other blood fractions	8	3.75	0.60%
870323	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1500 but not over 3000cc	9	28.01	4.47%

853710	Boards, panels, consoles, desks and other bases; for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage not exceeding 1000 volts	10	6.75	1.08%
853669	Electrical apparatus; plugs and sockets, for a voltage not exceeding 1000 volts	11	2.21	0.35%
847989	Machines and mechanical appliances; having individual functions, n.e.c. or included in this chapter	12	5.00	0.80%
711031	Metals; rhodium, unwrought or in powder form	13	3.56	0.57%
842199	Machinery; parts for filtering or purifying liquids or gases	14	1.87	0.30%
840999	Engines; parts for internal combustion piston engines (excluding spark-ignition)	15	3.28	0.52%
903180	Instruments, appliances and machines; for measuring or checking n.e.c. in chapter 90	16	2.52	0.40%
851220	Lighting or visual signalling equipment; electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)	17	1.92	0.31%
300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale	18	26.30	4.20%
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	19	2.23	0.36%
840734	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 1000cc	20	2.41	0.38%
Total			145.83	23.28%

Source: Project Team based on ITC Trade Map data

Table D.6: Top 20 extra-EU exported HS6 products for Italy

HS6 Code	***HS6 Description***	***Rank***	***Value extra EU***	***Share Extra EU export of the country***
240399	Tobacco; other than homogenised or reconstituted or smoking	1	1.55	0.66%
900410	Sunglasses; corrective, protective or other	2	1.71	0.73%

890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds	3	2.77	1.18%
640359	Footwear; n.e.c. in heading no. 6403, (not covering the ankle), outer soles and uppers of leather	4	0.92	0.39%
420221	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of leather or of composition leather	5	3.29	1.41%
190219	Food preparations; pasta, uncooked (excluding that containing eggs), not stuffed or otherwise prepared	6	1.07	0.46%
410712	Leather; further prepared after tanning or crusting, including parchment-dressed leather, of bovine (including buffalo) or equine animals, without hair on, other than leather of heading 41.14, whole hides and skins, grain splits	7	0.72	0.31%
690721	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight not over 0.5%	8	1.88	0.80%
420231	Cases and containers; of a kind normally carried in the pocket or in the handbag, with outer surface of leather or of composition leather	9	0.81	0.35%
842240	Machinery; for packing or wrapping	10	1.60	0.69%
150910	Vegetable oils; olive oil and its fractions, virgin, whether or not refined, but not chemically modified	11	0.82	0.35%
220410	Wine; sparkling	12	1.21	0.52%
890392	Motorboats; (other than outboard motorboats), for pleasure or sports, other than inflatable	13	2.10	0.90%
842290	Machinery; parts of machinery of heading no. 8422	14	0.81	0.35%
220421	Wine; still, in containers holding 2 litres or less	15	2.96	1.27%
842230	Machinery; for filling, closing, sealing, capsuling or labelling bottles, cans, bags or other containers, machinery for aerating beverages	16	0.91	0.39%
420222	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of sheeting of plastics or of textile materials	17	1.40	0.60%
640399	Footwear; n.e.c. in heading no. 6403, (not covering the ankle), outer soles of	18	1.82	0.78%

	rubber, plastics or composition leather, uppers of leather			
040690	Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406	19	0.80	0.34%
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	20	1.46	0.63%
Total			30.64	13.10%

Source: Project Team based on ITC Trade Map data

Table D.7: Top 20 extra-EU exported HS6 products for Netherlands

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
890392	Motorboats; (other than outboard motorboats), for pleasure or sports, other than inflatable	1	3.23	1.60%
060290	Plants, live; n.e.c. in heading no. 0602	2	1.18	0.59%
120991	Seeds; vegetable seeds, of a kind used for sowing	3	1.11	0.55%
270799	Oils and other products of the distillation of high temperature coal tar; n.e.c. in heading no. 2707	4	2.86	1.42%
848620	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor devices or of electronic integrated circuits	5	13.74	6.83%
060110	Plants, live; bulbs, tubers, tuberous roots, corms, crowns and rhizomes, dormant	6	0.58	0.29%
190110	Food preparations; of flour, meal, starch, malt extract or milk products, suitable for infants or young children, put up for retail sale	7	1.74	0.86%
060319	Flowers, cut; flowers and buds of a kind suitable for bouquets or ornamental purposes, fresh, other than roses, carnations, orchids, chrysanthemums or lillies	8	0.81	0.40%
284420	Uranium; enriched in U235, plutonium, their compounds, alloys dispersions (including cermets), ceramic products and mixtures containing uranium enriched in U235, plutonium or compounds of these products	9	0.56	0.28%
902214	Apparatus based on the use of x-rays; including radiography or radiotherapy apparatus, for medical, surgical or	10	0.86	0.43%

	veterinary uses, not dental uses, excluding computed tomography apparatus			
902131	Artificial parts of the body	11	1.21	0.60%
200410	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen	12	0.77	0.39%
901813	Medical, surgical instruments and appliances; magnetic resonance imaging apparatus	13	0.65	0.32%
220300	Beer; made from malt	14	1.35	0.67%
848690	Machines and apparatus of heading 8486; parts and accessories	15	2.88	1.43%
901839	Medical, surgical instruments and appliances; catheters, cannulae and the like	16	2.79	1.39%
902139	Artificial parts of the body; excluding artificial joints	17	1.00	0.50%
870120	Tractors; road, for semi-trailers	18	1.79	0.89%
902190	Appliances; worn, carried or implanted in the body, to compensate for a defect or disability	19	0.84	0.42%
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	20	1.35	0.67%
Total			41.31	20.54%

Source: Project Team based on ITC Trade Map data

Table D.8: Top 20 extra-EU exported HS6 products for Poland

HS6 Code	***HS6 Description***	***Rank***	***Value extra EU***	***Share Extra EU export of the country***
902140	Hearing aids (excluding parts and accessories)	1	0.69	1.02%
270400	Coke and semi-coke; of coal, lignite or peat, whether or not agglomerated; retort carbon	2	0.74	1.10%
890590	Vessels; light, fire-floats, floating cranes and other vessels, the navigability of which is subsidiary to their main function, floating docks	3	0.53	0.78%
845121	Drying machines; of a dry linen capacity not exceeding 10kg	4	0.27	0.39%

020713	Meat and edible offal; of fowls of the species Gallus domesticus, cuts and offal, fresh or chilled	5	0.26	0.38%
890399	Yachts and other vessels; for pleasure or sports, rowing boats and canoes, n.e.c. in heading no. 8903, other than inflatable	6	0.26	0.39%
845011	Washing machines; household or laundry-type, fully-automatic, (of a dry linen capacity not exceeding 10kg)	7	0.33	0.49%
180690	Chocolate and other food preparations containing cocoa; n.e.c. in chapter 18	8	0.45	0.66%
830990	Stoppers; caps and lids, of base metal	9	0.27	0.40%
710691	Metals; silver, unwrought, (but not powder)	10	0.83	1.23%
340220	Washing and cleaning preparations; surface-active, whether or not containing soap (excluding those of heading no. 3401), put up for retail sale	11	0.44	0.64%
240220	Cigarettes; containing tobacco	12	0.48	0.70%
841191	Turbines; parts of turbo-jets and turbo-propellers	13	1.24	1.83%
890120	Tankers	14	0.83	1.22%
890190	Vessels; n.e.c. in heading no. 8901, for the transport of goods and other vessels for the transport of both persons and goods	15	1.26	1.85%
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds	16	0.32	0.46%
870423	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a g.v.w. exceeding 20 tonnes), n.e.c. in item no 8704.1	17	0.34	0.49%
940360	Furniture; wooden, other than for office, kitchen or bedroom use	18	0.62	0.91%
940350	Furniture; wooden, for bedroom use	19	0.26	0.39%
940161	Seats; with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)	20	0.45	0.66%
Total			10.87	16.00%

Source: Project Team based on ITC Trade Map data

Table D.9: Top 20 extra-EU exported HS6 products for Romania

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
840733	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 250cc but not exceeding 1000cc	1	0.28	1.35%
10410	Sheep; live	2	0.21	1.02%
870331	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity not over 1500cc	3	0.27	1.32%
440792	Wood; beech (Fagus spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, thicker than 6mm	4	0.14	0.71%
240399	Tobacco; other than homogenised or reconstituted or smoking	5	0.22	1.06%
100390	Cereals; barley, other than seed	6	0.38	1.88%
100199	Cereals; wheat and meslin, other than durum wheat, other than seed	7	1.31	6.40%
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	8	0.36	1.74%
120600	Oil seeds; sunflower seeds, whether or not broken	9	0.15	0.73%
441860	Wood; posts and beams	10	0.10	0.51%
441011	Particle board of wood, whether or not agglomerated with resins or other organic binding substances	11	0.18	0.88%
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds	12	0.28	1.37%
720719	Iron or non-alloy steel; semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, other than rectangular or square cross-section	13	0.16	0.76%
722300	Steel, stainless; wire	14	0.11	0.53%
330510	Hair preparations; shampoos	15	0.14	0.67%
100590	Cereals; maize (corn), other than seed	16	0.81	3.99%

870321	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity not over 1000cc	17	0.32	1.59%
720449	Ferrous waste and scrap; n.e.c. in heading no. 7204	18	0.48	2.34%
848220	Bearings; tapered roller bearings, including cone and tapered roller assemblies	19	0.10	0.50%
441012	Oriented strand board (OSB) of wood, whether or not agglomerated with resins or other organic binding substances	20	0.12	0.60%
Total			6.12	29.94%

Source: Project Team based on ITC Trade Map data

Table D.10: Top 20 extra-EU exported HS6 products for Spain

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
150910	Vegetable oils; olive oil and its fractions, virgin, whether or not refined, but not chemically modified	1	1.06	0.89%
150990	Vegetable oils; olive oil and its fractions, other than virgin, whether or not refined, but not chemically modified	2	0.47	0.39%
020322	Meat; of swine, hams, shoulders and cuts thereof, with bone in, frozen	3	0.57	0.47%
020329	Meat; of swine, n.e.c. in item no. 0203.2, frozen	4	2.75	2.31%
690723	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight over 10%	5	0.53	0.44%
200570	Vegetable preparations; olives, prepared or preserved otherwise than by vinegar or acetic acid, not frozen	6	0.45	0.38%
690721	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight not over 0.5%	7	1.43	1.20%
020649	Offal, edible; of swine, (other than livers), frozen	8	0.69	0.58%
721632	Iron or non-alloy steel; I sections, hot-rolled, hot-drawn or extruded, of a height of 80mm or more	9	0.44	0.37%
870331	Vehicles; with only compression-ignition internal combustion piston engine (diesel	10	0.55	0.46%

	or semi-diesel), cylinder capacity not over 1500cc			
870321	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity not over 1000cc	11	1.34	1.13%
681099	Cement, concrete or artificial stone; articles (other than prefabricated structural components for building or civil engineering), whether or not reinforced, n.e.c. in heading no. 6810	12	0.56	0.47%
690722	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight over 0.5% but not over 10%	13	0.36	0.30%
330300	Perfumes and toilet waters	14	1.13	0.95%
850231	Electric generating sets; wind-powered, (excluding those with spark-ignition or compression-ignition internal combustion piston engines)	15	0.47	0.39%
871000	Tanks and other armoured fighting vehicles; motorised, whether or not fitted with weapons, and parts of such vehicles	16	0.35	0.29%
220421	Wine; still, in containers holding 2 litres or less	17	1.21	1.02%
870332	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity over 1500 but not over 2500cc	18	1.22	1.03%
380892	Fungicides; other than containing goods specified in Subheading Note 1 to this Chapter; put up in forms or packings for retail sale or as preparations or articles	19	0.34	0.29%
870421	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvw not exceeding 5 tonnes), n.e.c. in item no 8704.1	20	1.37	1.15%
Total			17.28	14.51%

Source: Project Team based on ITC Trade Map data

Table D.11: Top 20 extra-EU exported HS6 products for Sweden

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	1	1.84	2.55%

481092	Paper and paperboard; multi-ply, coated with kaolin or other inorganic substances only, for non-graphic purposes, n.e.c. in heading no. 4810, in rolls or sheets	2	1.03	1.43%
722540	Steel, alloy; flat-rolled, width 600mm or more, hot-rolled, not in coils	3	0.52	0.72%
440711	Wood; coniferous species, of pine (Pinus spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	4	1.17	1.63%
220860	Vodka	5	0.27	0.37%
850239	Electric generating sets; (excluding those with spark-ignition or compression-ignition internal combustion piston engines), other than wind powered	6	0.31	0.43%
720529	Iron or steel, pig iron, spiegeleisen; powders (excluding alloy steel)	7	0.24	0.33%
240399	Tobacco; other than homogenised or reconstituted or smoking	8	0.39	0.53%
391400	Ion-exchangers; based on polymers of heading no. 3901 to 3913, in primary forms	9	0.26	0.36%
391390	Polymers, natural and modified natural; in primary forms (excluding alginic acid, its salts and esters)	10	0.27	0.38%
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	11	0.69	0.96%
843041	Boring or sinking machinery; self-propelled, n.e.c. in heading no. 8430	12	0.27	0.37%
870360	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, capable of being charged by plugging to external source of electric power	13	1.47	2.04%
902720	Chromatographs and electrophoresis instruments	14	0.25	0.34%
260112	Iron ores and concentrates; agglomerated (excluding roasted iron pyrites)	15	1.83	2.54%
470321	Wood pulp; chemical wood pulp, soda or sulphate, (other than dissolving grades), semi-bleached or bleached, of coniferous wood	16	0.69	0.96%
300214	Blood, human or animal, antisera, other blood fractions and immunological products; immunological products, mixed, put up in measured doses or in forms or packings for retail sale	17	0.68	0.94%

870120	Tractors; road, for semi-trailers	18	1.01	1.40%
843143	Boring or sinking machinery; parts of the machinery of item no. 8430.41 or 8430.41	19	0.36	0.51%
870423	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a g.v.w. exceeding 20 tonnes), n.e.c. in item no 8704.1	20	0.46	0.63%
Total			13.99	19.43%

Source: Project Team based on ITC Trade Map data

Table D.12: Top 40 extra-EU exported HS6 products for EU

HS6 Code	*HS6 Description*	*Rank*	*Value extra EU*	*Share Extra EU export of the country*
880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15,000kg	1	33.35	1.57%
890392	Motorboats; (other than outboard motorboats), for pleasure or sports, other than inflatable	2	7.36	0.35%
420221	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of leather or of composition leather	3	7.16	0.34%
220421	Wine; still, in containers holding 2 litres or less	4	10.88	0.51%
330210	Odoriferous substances and mixtures; of a kind used in the food or drink industries	5	7.58	0.36%
270799	Oils and other products of the distillation of high temperature coal tar; n.e.c. in heading no. 2707	6	6.56	0.31%
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	7	9.55	0.45%
330300	Perfumes and toilet waters	8	6.59	0.31%
870332	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity over 1500 but not over 2500cc	9	9.85	0.46%
020329	Meat; of swine, n.e.c. in item no. 0203.2, frozen	10	6.86	0.32%
300220	Vaccines; for human medicine	11	30.81	1.45%

300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale	12	88.21	4.16%
300212	Blood, human or animal, antisera, other blood fractions and immunological products; antisera and other blood fractions	13	8.97	0.42%
870380	Vehicles; with only electric motor for propulsion	14	12.14	0.57%
300215	Blood, human or animal, antisera, other blood fractions and immunological products; immunological products, put up in measured doses or in forms or packings for retail sale	15	39.12	1.85%
870340	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, incapable of being charged by plugging to external source of electric power	16	19.60	0.92%
870360	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, capable of being charged by plugging to external source of electric power	17	6.61	0.31%
870120	Tractors; road, for semi-trailers	18	6.98	0.33%
840999	Engines; parts for internal combustion piston engines (excluding spark-ignition)	19	6.84	0.32%
901839	Medical, surgical instruments and appliances; catheters, cannulae and the like	20	6.95	0.33%
271600	Electrical energy	21	7.92	0.37%
382200	Reagents; diagnostic or laboratory reagents on a backing and prepared diagnostic or laboratory reagents whether or not on a backing, other than those of heading no. 3002 or 3006; certified reference material	22	8.73	0.41%
841191	Turbines; parts of turbo-jets and turbo-propellers	23	8.47	0.40%
841112	Turbo-jets; of a thrust exceeding 25kN	24	8.84	0.42%
870323	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1500 but not over 3000cc	25	43.36	2.05%
847989	Machines and mechanical appliances; having individual functions, n.e.c. or included in this chapter	26	9.08	0.43%
853710	Boards, panels, consoles, desks and other bases; for electric control or the distribution of electricity, (other than switching apparatus of heading no.	27	11.45	0.54%

	8517), for a voltage not exceeding 1000 volts			
901890	Medical, surgical or dental instruments and appliances; n.e.c. in heading no. 9018	28	11.60	0.55%
870840	Vehicle parts; gear boxes and parts thereof	29	11.70	0.55%
848180	Taps, cocks, valves and similar appliances; for pipes, boiler shells, tanks, vats or the like, including thermostatically controlled valves	30	10.37	0.49%
848620	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor devices or of electronic integrated circuits	31	15.39	0.73%
330499	Cosmetic and toilet preparations; n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)	32	9.84	0.46%
870322	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1000 but not over 1500cc	33	11.54	0.54%
210690	Food preparations; n.e.c. in item no. 2106.10	34	7.79	0.37%
710231	Diamonds; non-industrial, unworked or simply sawn, cleaved or bruted, but not mounted or set	35	7.48	0.35%
870899	Vehicle parts and accessories; n.e.c. in heading no. 8708	36	11.61	0.55%
880330	Aircraft and spacecraft; parts of aeroplanes or helicopters n.e.c. in heading no. 8803	37	7.20	0.34%
870829	Vehicles; parts and accessories, of bodies, other than safety seat belts	38	8.03	0.38%
392690	Plastics; other articles n.e.c. in chapter 39	39	8.80	0.42%
870324	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 3000cc	40	10.94	0.52%

Source: Project Team based on ITC Trade Map data

D.2 Most extra-EU exporting HS6 products with descriptive variables, by country

To provide a summary description of the firms producing the top exported products, the Project Team relied on publicly available data reported in Eurostat. The website provides basic business statistics aggregated at NACE level, such as aggregate turnover and number of employees, which allow to outline a profile of firms active in those sectors. The Project Team exploited the classification at the lowest level of aggregation available, i.e. NACE at 4 digits, which narrows considerably the set of firms under consideration. The use of NACE statistics requires, however, to link HS products (as our analysis

identifies top export products at the HS level) and NACE sectors (as the Eurostat variables are available only according to the NACE classification). To do so, the Project Team relied on a mapping between HS and NACE developed by Prometeia. The link between the two classifications maps, first, the HS into the CPA (Classification of Products by Activity), a classification of products by economic activity developed by Eurostat. Since every CPA is linked to only one NACE, this link is straightforward. A caveat of the analysis is that a single product can pertain to multiple CPA groups. Indeed, if the production process is not extremely specific, a single product might be manufactured by firms in different sectors as far as these sectors are sufficiently similar to each other. Since it is not possible without detailed statistics on production to link uniquely a product with a sector, the Project Team reported the product for each sector to which it was linked. The Project Team plans to further refine this classification for the following iteration of this report. The resulting tables, provided in this Annex, report the results of the matching of HS products with NACE sectors, together with characteristics of the sector in terms of size (number of firms), efficiency in terms of value added per employee in Full Time Equivalent, revenues (turnover per firm) and others.[362] The Project Team aims at further enriching the description of the firms as follows: we will provide a benchmark for the country to allow a more precise characterization of the firms in sectors producing top exported products with respect to the average firm in the country.

As shown in the following tables below, the following variables were used to describe the sectors:

- N.firms: the number of firms in the sector;
- Avg. N. Employees per firm: the number of employees in the sector divided by the number of firms;
- Avg. N. Employees (FTE) per firm: the number of employees in full time equivalent in the sector divided by the number of firms. Full time equivalent adjusts the number of workers by part time (e.g. a 50% part time would count as half worker);
- Turnover per firm (million euro): the total turnover divided by the number of firms;
- Turnover per Employee (FTE) (million euro); the total turnover divided by the number of employees in full time equivalent;
- Energy over Turnover (million euro): energy expenses divided by the total turnover (however, energy expenses sometimes miss in the dataset);363
- Gross Margin per firm (million euro); the gross margin divided by the total number of firms;
- Investment per Employee (FTE) (thousand euro): the investment per employee multiplied by the total number of employees (to obtain total investment) divided by the number of employees in full time equivalent (it works as far as they are aggregating investment and then taking the ratio with employees);
- Value Added per employee (FTE) (thousand euro): the value added per employee in full time equivalent.

When all variables had missing data, certain top extra-EU HS6 products were dropped under specific circumstances.

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[362] Full Time Equivalent is a measure of labour input which adjusts the number of employees by the time worked and it allows to have a cleaner view of the labour input of the firm.

[363] Values equal to 0.00 reflect a positive number at the 4 decimal digit level.

Table D.13: Description of top Austrian export sectors, 2019

Code HS	Label HS	Code NACE	Label NACE	N. Firms	Avg. N. Employees per firm	Avg. N. Employees (FTE) per firm	Turnover per firm	Turnover per Employee (FTE)	Energy over Turnover	Gross Margin per firm	Investment per Employee	Value Added per employee (FTE)
220210	Waters; including mineral and aerated, containing added sugar or other sweetening matter or flavoured	1107	Manufacture of soft drinks; production of mineral waters and other bottled waters	72	59	56	71	1.27	0.00	15.32	32	359
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	1610	Sawmilling and planing of wood	945	11	11	5	0.47	0.03	0.65	18	115
441011	Particle board of wood, whether or not agglomerated with resins or other organic binding substances	1621	Manufacture of veneer sheets and wood-based panels	27	157	152	61	0.40	0.03	7.71	19	124
441899	Wood; builders' joinery and carpentry of wood n.e.c. in heading no. 4418, other than of bamboo	1623	Manufacture of other builders' carpentry and joinery	1100	13	12	3	0.22	0.01	0.26	7	73
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for	2120	Manufacture of pharmaceutical preparations	93	117	110	38	0.35	0.01	6.31	38	145

	therapeutic or prophylactic uses, packaged for retail sale											
300212	Blood, human or animal, antisera, other blood fractions and immunological products; antisera and other blood fractions	2120	Manufacture of pharmaceutical preparations	93	117	110	38	0.35	0.01	6.31	38	145
381600	Refractory cements, mortars, concretes and similar compositions; other than products of heading no. 3801	2320	Manufacture of refractory products	12	179	172	75	0.43	0.03	11.32	13	158
722592	Steel, alloy; flat-rolled, width 600mm or more, n.e.c. in heading no. 7225, plated or coated with zinc (other than electrolytically	2410	Manufacture of basic iron and steel and of ferro-alloys	8	2811	2563	1248	0.49	0.10	112.55	21	134
730429	Iron or steel (excluding cast iron or stainless steel); seamless, casing and tubing, of a kind used in drilling for oil or gas	2420	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	11	352	343	112	0.33	0.01	10.29	16	97
830210	Hinges; suitable for furniture, doors, staircases, windows, blinds, coachwork, saddlery, trunks, chests, caskets or the like, of base metal	2572	Manufacture of locks and hinges	114	94	91	23	0.25	0.01	3.24	27	108
830242	Mountings, fittings and similar articles; suitable for furniture of base metal	2572	Manufacture of locks and hinges	114	94	91	23	0.25	0.01	3.24	27	108

903120	Test benches	2651	Manufacture of instruments and appliances for measuring, testing and navigation	216	35	32	7	0.23	0.00	1.21	8	108
850220	Electric generating sets; with spark-ignition internal combustion piston engines	2711	Manufacture of electric motors, generators and transformers	57	252	239	79	0.33	0.01	3.39	5	97
842860	Teleferics, chair-lifts, ski-draglines, traction mechanisms for funiculars	2822	Manufacture of lifting and handling equipment	132	130	126	42	0.33	0.00	3.43	7	102
842839	Elevators and conveyors; continuous-action, for goods or materials, n.e.c. in item no. 8428.20, 8428.31, 8428.32 or 8428.33	2822	Manufacture of lifting and handling equipment	132	130	126	42	0.33	0.00	3.43	7	102
847780	Machinery; for working rubber or plastics or for the manufacture of products from these materials, n.e.c. in this chapter	2896	Manufacture of plastics and rubber machinery	45	163	157	52	0.33	0.00	7.36	8	122
870530	Vehicles; fire fighting vehicles	2910	Manufacture of motor vehicles	13	1517	1482	989	0.67	0.00	60.92	17	119
840734	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 1000cc	2910	Manufacture of motor vehicles	13	1517	1482	989	0.67	0.00	60.92	17	119

860400	Railway or tramway maintenance or service vehicles; whether or not self-propelled (e.g. workshops, cranes, ballast tampers, trackliners, testing coaches and track inspection vehicles)	3020	Manufacture of railway locomotives and rolling stock	10								
871130	Motorcycles (including mopeds) and cycles; fitted with an auxiliary motor, reciprocating internal combustion piston engine, of cylinder capacity exceeding 250cc but not exceeding 500cc, with or without side-cars; side-cars	3091	Manufacture of motorcycles	7	482	464	206	0.44	0.00	16.70	14	102

Source: Project Team based on Eurostat data

Table D.14: Description of top Belgium export sectors, 2019

Code HS	*Label HS*	*Code NACE*	*Label NACE*	*N. Firms*	*Avg. N. Employees per firm*	*Avg. N. Employees (FTE) per firm*	*Turnover per firm*	*Turnover per Employee (FTE)*	*Energy over Turnover*	*Gross Margin per firm*	*Investment per Employee*	*Value Added per employee (FTE)*
710231	Diamonds; non-industrial, unworked or simply sawn, cleaved or bruted, but not mounted or set	0899	Other mining and quarrying n.e.c.	5	1	1	0	0.25	0.00	0.08	23	138
200410	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen	1031	Processing and preserving of potatoes	63	93	85	46	0.54	0.04	4.76	49	117

180620	Chocolate & other food preparations containing cocoa; in blocks, slabs or bars weighing more than 2kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, content exceeding 2kg	1082	Manufacture of cocoa, chocolate and sugar confectionery	472	20	17	11	0.61	0.01	0.77	22	115
270799	Oils and other products of the distillation of high temperature coal tar; n.e.c. in heading no. 2707	2014	Manufacture of other organic basic chemicals	61	209	191	228	1.19	0.05	27.11	54	262
390931	Polymethylene phenyl isocyanate crude MDI, polymeric MDI, in primary forms	2016	Manufacture of plastics in primary forms	90	76	70	62	0.89	0.07	9.04	65	246
293359	Heterocyclic compounds; containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, (other than malonylurea and its derivatives, loprazolam, mecloqualone, methaqualone, zipeprol, and salts thereof) n.e.c. in 2933.5	2110	Manufacture of basic pharmaceutical products	64	23	21	8	0.39	0.01	0.89	34	137

293729	Steroidal hormones, their derivatives and structural analogues; other than cortisone, hydrocortisone, prednisone (dehydrocortisone), prednisolone (dehydrohydrocortisone), halogenated derivatives of corticosteroidal hormones, oestrogen and progestogens	2110	Manufacture of basic pharmaceutical products	64	23	21	8	0.39	0.01	0.89	34	137
300420	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale (300432); Medicaments; containing antibiotics (other than penicillins, streptomycins or their derivatives), for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	133	207	186	239	1.29	0.00	74.53	29	528
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	133	207	186	239	1.29	0.00	74.53	29	528

300610	Pharmaceutical goods; sterile surgical catgut, suture materials, tissue adhesives, laminaria, laminaria tents, absorbable surgical or dental haemostatics, and surgical or dental adhesion barriers	2120	Manufacture of pharmaceutical preparations	133	207	186	239	1.29	0.00	74.53	29	528
300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sal	2120	Manufacture of pharmaceutical preparations	133	207	186	239	1.29	0.00	74.53	29	528
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	133	207	186	239	1.29	0.00	74.53	29	528

300220	Vaccines; for human medicine	2120	Manufacture of pharmaceutical preparations	133	207	186	239	1.29	0.00	74.53	289	528
844630	Weaving machines (looms); for weaving fabrics of a width exceeding 30cm, shuttleless type	2894	Manufacture of machinery for textile, apparel and leather production	37	56	47	17	0.36	0.01	0.46	11	80
847590	Machines; parts, of those for assembling electric or electronic lamps, tubes, valves or flash-bulbs, in glass envelopes and manufacturing or hot working glass or glassware	2899	Manufacture of other special-purpose machinery n.e.c.	170	13	12	4	0.33	0.01	0.44	8	106
902139	Artificial parts of the body; excluding artificial joint	3250	Manufacture of medical and dental instruments and supplies	1238	5	4	2	0.37	0.01	0.21	11	117
300610	Pharmaceutical goods; sterile surgical catgut, suture materials, tissue adhesives, laminaria, laminaria tents, absorbable surgical or dental haemostatics, and surgical or dental adhesion barriers	3250	Manufacture of medical and dental instruments and supplies	1238	5	4	2	0.37	0.01	0.21	11	117
902131	Artificial parts of the body	3250	Manufacture of medical and dental instruments and supplies	1238	5	4	2	0.37	0.01	0.21	11	117

Source: Project Team based on Eurostat data

Table D.15: Description of top Czech Republic export sectors, 2019

Code HS	Label HS	Code NACE	Label NACE	N. Firms	Avg. N. Employees per firm	Avg. N. Employees (FTE) per firm	Turnover per firm	Turnover per Employee (FTE)	Energy over Turnover	Gross Margin per firm	Investment per Employee	Value Added per employee (FTE)
961900	Sanitary towels (pads) and tampons, napkins and napkin liners for babies and similar articles, of any material	1722	Manufacture of household and sanitary goods and of toilet requisites	29	107	106	22	0.21	0.02	1.53	17	38
401110	Rubber; new pneumatic tyres, of a kind used on motor cars (including station wagons and racing cars	2211	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	356	24	24	10	0.41	0.01	1.42	19	88
391710	Plastics; artificial guts (sausage casings) of hardened protein or of cellulosic materials	2221	Manufacture of plastic plates, sheets, tubes and profiles	218	57	56	8	0.15	0.02	1.13	8	43
930400	Firearms; (e.g. spring, air or gas guns and pistols, truncheons), excluding those of heading no. 9307	2540	Manufacture of weapons and ammunition	98	46	46	5	0.10	0.02	1.08	6	45
847141	Automatic data processing machines; comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined, n.e.c. in item no. 8471.30	2620	Manufacture of computers and peripheral equipment	218	26	26	33	1.29	0.00	-0.03	3	18

847170	Units of automatic data processing machines; storage units	2620	Manufacture of computers and peripheral equipment	218	26	26	33	1.29	0.00	-0.03	3	18
847150	Units of automatic data processing machines; processing units other than those of item no. 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units	2620	Manufacture of computers and peripheral equipment	218	26	26	33	1.29	0.00	-0.03	3	18
901210	Microscopes (excluding optical microscopes); diffraction apparatus	2651	Manufacture of instruments and appliances for measuring, testing and navigation	817	18	18	5	0.29	0.00	0.54	6	56
853620	Electrical apparatus; automatic circuit breakers, for a voltage not exceeding 1000 volts	2712	Manufacture of electricity distribution and control apparatus	1417	18	17	3	0.15	0.01	0.30	5	41
853669	Electrical apparatus; plugs and sockets, for a voltage not exceeding 1000 volts	2733	Manufacture of wiring devices	106	44	43	4	0.10	0.01	0.45	14	31

854720	Insulating fittings; of plastics, for electrical machines, of insulating material only (except minor assembly parts), excluding those of heading no. 8546	2733	Manufacture of wiring devices	106	44	43	4	0.10	0.01	0.45	14	31
851220	Lighting or visual signalling equipment; electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)	2740	Manufacture of electric lighting equipment	257	60	60	10	0.16	0.01	0.71	12	37
841330	Pumps; fuel, lubricating or cooling medium pumps for internal combustion piston engines	2813	Manufacture of other pumps and compressors	219	37	36	5	0.15	0.01	0.35	7	33
842951	Front-end shovel loaders	2892	Manufacture of machinery for mining, quarrying and construction	92	93	92	16	0.18	0.02	0.98	5	38
870332	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1000 but not over 1500cc	2910	Manufacture of motor vehicles	81	554	553	317	0.57	0.00	33.11	27	95
870380	Vehicles; with only electric motor for propulsion	2910	Manufacture of motor vehicles	81	554	553	317	0.57	0.00	33.11	27	95
870321	Vehicles; with only spark-ignition internal combustion	2910	Manufacture of motor vehicles	81	554	553	317	0.57	0.00	33.11	27	95

	reciprocating piston engine, cylinder capacity not over 1000cc											
870322	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1000 but not over 1500cc	2910	Manufacture of motor vehicles	81	554	553	317	0.57	0.00	33.11	27	95
950300	Tricycles, scooters, pedal cars and similar wheeled toys; dolls' carriages; dolls; other toys; reduced-size (scale) models and similar recreational models, working or not; puzzles of all kinds	3240	Manufacture of games and toys	513	13	13	2	0.13	0.01	0.24	5	40
711230	Waste and scrap of precious metal or of metal clad with precious metal; ash containing precious metal or precious metal compounds	3811	Collection of non-hazardous waste	4777	4	4	0	0.10	0.01	0.05	9	30

Source: Project Team based on Eurostat data

Table D.16: Description of top French export sectors, 2019

Code HS	***Label HS***	***Code NACE***	***Label NACE***	***N. Firms***	***Avg. N. Employees per firm***	***Avg. N. Employees (FTE) per firm***	***Turnover per firm***	***Turnover per Employee (FTE)***	***Energy over Turnover***	***Gross Margin per firm***	***Investment per Employee***	***Value Added per employee (FTE)***

220820	Wine; still, in containers holding 2 litres or less (220421); Spirits obtained by distilling grape wine or grape marc	1101	Distilling, rectifying and blending of spirits	815	10	10	5	0.57	0.01	0.83	22	169
220410	Wine; sparkling	1102	Manufacture of wine from grape	1280	17	16	11	0.71	0.01	1.75	37	180
220421	Wine; still, in containers holding 2 litres or less	1102	Manufacture of wine from grape	1280	17	16	11	0.71	0.01	1.75	37	180
621149	Track suits and other garments n.e.c.; women's or girls', of textile materials n.e.c. in item no. 6211.4 (not knitted or crocheted)	1419	Manufacture of other wearing apparel and accessories	3760	1	1	0	0.21	0.01	0.02	4	77
420221	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of leather or of composition leather	1512	Manufacture of luggage, handbags and the like, saddlery and harness	2836	9	8	2	0.28	0.00	0.48		115
420222	Cases and containers; handbags (whether or not with shoulder strap and	1512	Manufacture of luggage, handbags and the like, saddlery and harness	2836	9	8	2	0.28	0.00	0.48		115

	including those without handle), with outer surface of sheeting of plastics or of textile materials											
420231	Cases and containers; of a kind normally carried in the pocket or in the handbag, with outer surface of leather or of composition leather	1512	Manufacture of luggage, handbags and the like, saddlery and harness	2836	9	8	2	0.28	0.00	0.48		115
380892	Fungicides; other than containing goods specified in Subheading Note 1 to this Chapter; put up in forms or packings for retail sale or as preparations or articles	2020	Manufacture of pesticides and other agrochemical products	47	223	192	128	0.67	0.00	9.70	15	153
330300	Perfumes and toilet waters	2042	Manufacture of perfumes and toilet preparations	1212	55	49	24	0.48	0.00	3.36	13	155
330499	Cosmetic and toilet preparations; n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)	2042	Manufacture of perfumes and toilet preparations	1212	55	49	24	0.48	0.00	3.36	13	155

381121	Lubricating oil additives; containing petroleum oils or oils obtained from bituminous minerals	2059	Manufacture of other chemical products n.e.c.	240	55	50	23	0.47	0.02	2.57	18	135
300431	Medicaments; containing insulin, for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	209			203		0.00	19.54		
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	209			203		0.00	19.54		
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds	3011	Building of ships and floating structures	167	123	113	39	0.34	0.00	3.67	10	109
880320	Aircraft and spacecraft; under-carriages and parts thereof	3030	Manufacture of air and spacecraft and related machinery	195			552		0.00	36.43		
841191	Turbines; parts of turbo-jets	3030	Manufacture of air and spacecraft and	195			552		0.00	36.43		

	and turbo-propellers		related machinery								
880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15,000kg	3030	Manufacture of air and spacecraft and related machinery	195		552		0.00	36.43		
880230	Aeroplanes and other aircraft; of an unladen weight exceeding 2000kg but not exceeding 15,000kg	3030	Manufacture of air and spacecraft and related machinery	195		552		0.00	36.43		
841112	Turbo-jets; of a thrust exceeding 25kN	3030	Manufacture of air and spacecraft and related machinery	195		552		0.00	36.43		

Source: Project Team based on Eurostat data

Table D.17: Description of top German export sectors, 2019

Code HS	*Label HS*	*Code NACE*	*Label NACE*	*N. Firms*	*Avg. N. Employees per firm*	*Avg. N. Employees (FTE) per firm*	*Turnover per firm*	*Turnover per Employee (FTE)*	*Energy over Turnover*	*Gross Margin per firm*	*Investment per Employee*	*Value Added per employee (FTE)*
300212	Blood, human or animal, antisera, other blood fractions and immunological products; antisera and other blood fractions	2120	Manufacture of pharmaceutical preparations	474	355	329	158	0.48	0.01	19.28	17	155

300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	474	355	329	158	0.48	0.01	19.28	17	155
300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale	2120	Manufacture of pharmaceutical preparations	474	355	329	158	0.48	0.01	19.28	17	155
711031	Metals; rhodium, unwrought or in powder form	2441	Precious metals production	140	34	33	107	3.26			7	117
903180	Instruments, appliances and machines; for measuring or checking n.e.c. in chapter 90	2651	Manufacture of instruments and appliances for measuring, testing and navigation	2478	74	70	16	0.22	0.01	1.52	7	95
853710	Boards, panels, consoles, desks and other bases; for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage not	2712	Manufacture of electricity distribution and control apparatus	1249	166	157	40	0.26	0.01	2.98	5	96

	exceeding 1000 volts											
853669	Electrical apparatus; plugs and sockets, for a voltage not exceeding 1000 volts	2733	Manufacture of wiring devices	658	88	82	19	0.23	0.01	1.74	11	89
851220	Lighting or visual signalling equipment; electrical, of a kind used on motor vehicles (excluding articles of heading no. 8539)	2740	Manufacture of electric lighting equipment	935	31	29	6	0.22	0.01	0.62	5	78
840999	Engines; parts for internal combustion piston engines (excluding spark-ignition)	2811	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	170	819	794	293	0.37	0.01	-4.21	12	91
842230	Machinery; for filling, closing, sealing, capsuling or labelling bottles, cans, bags or other containers, machinery for aerating beverages	2829	Manufacture of other general-purpose machinery n.e.c.	2586	61	58	13	0.23	0.01	0.96	6	85
842199	Machinery; parts for filtering or purifying liquids or gases	2829	Manufacture of other general-purpose machinery n.e.c.	2586	61	58	13	0.23	0.01	0.96	6	85

847989	Machines and mechanical appliances; having individual functions, n.e.c. or included in this chapter	2899	Manufacture of other special-purpose machinery n.e.c.	3578	45	43	8	0.20	0.01	0.64	4	77
870360	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, capable of being charged by plugging to external source of electric power	2910	Manufacture of motor vehicles	259	2240	2182	1663	0.76	0.00	95.90	24	143
840734	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 1000cc	2910	Manufacture of motor vehicles	259	2240	2182	1663	0.76	0.00	95.90	24	143
870323	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1500 but not over 3000cc	2910	Manufacture of motor vehicles	259	2240	2182	1663	0.76	0.00	95.90	24	143

870340	Vehicles; with only electric motor for propulsion (870380); Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, incapable of being charged by plugging to external source of electric power	2910	Manufacture of motor vehicles	259	2240	2182	1663	0.76	0.00	95.90	24	143
870332	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity over 1500 but not over 2500cc	2910	Manufacture of motor vehicles	259	2240	2182	1663	0.76	0.00	95.90	24	143
870380	Vehicles; with only electric motor for propulsion	2910	Manufacture of motor vehicles	259	2240	2182	1663	0.76	0.00	95.90	24	143
870840	Vehicle parts; gear boxes and parts thereof	2932	Manufacture of other parts and accessories for motor vehicles	963	271	264	82	0.31	0.01	3.58	10	85

880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15,000kg	3030	Manufacture of air and spacecraft and related machinery	213	412	401	161	0.40	0.01	13.84	11	135

Source: Project Team based on Eurostat data

Table D.18: Description of top Italian export sectors, 2019

Code HS	*Label HS*	*Code NACE*	*Label NACE*	*N. Firms*	*Avg. N. Employees per firm*	*Avg. N. Employees (FTE) per firm*	*Turnover per firm*	*Turnover per Employee (FTE)*	*Energy over Turnover*	*Gross Margin per firm*	*Investment per Employee*	*Value Added per employee (FTE)*
150910	Vegetable oils; olive oil and its fractions, virgin, whether or not refined, but not chemically modified	1041	Manufacture of oils and fats	2920	2	2	2	1.03	0.00	0.11	21	102
040690	Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406	1051	Operation of dairies and cheese making	2787	14	11	7	0.63	0.01	0.43	14	92
190219	Food preparations; pasta, uncooked (excluding that containing eggs), not stuffed or otherwise prepared	1073	Manufacture of macaroni, noodles, couscous and similar farinaceous products	3727	6	5	2	0.46	0.00	0.22	19	105
220421	Wine; still, in containers	1102	Manufacture of wine from grape	1753	11	10	6	0.66	0.00	0.56	23	111

	holding 2 litres or less											
220410	Wine; sparkling	1102	Manufacture of wine from grape	1753	11	10	6	0.66	0.00	0.56	23	111
240399	Tobacco; other than homogenised or reconstituted or smoking	1200	Manufacture of tobacco products	9	341	319	200	0.63	0.00	45.27	24	217
410712	Leather; further prepared after tanning or crusting, including parchment-dressed leather, of bovine (including buffalo) or equine animals, without hair on, other than leather of heading 41.14, whole hides and skins, grain splits	1511	Tanning and dressing of leather; dressing and dyeing of fur	1717	12	11	4	0.35	0.00	0.34	9	82
420221	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of leather or of composition leather	1512	Manufacture of luggage, handbags and the like, saddlery and harness	5122	9	7	2	0.29	0.00	0.24	4	78

420231	Cases and containers; of a kind normally carried in the pocket or in the handbag, with outer surface of leather or of composition leather	1512	Manufacture of luggage, handbags and the like, saddlery and harness	5122	9	7	2	0.29	0.00	0.24	4	78
420222	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of sheeting of plastics or of textile materials	1512	Manufacture of luggage, handbags and the like, saddlery and harness	5122	9	7	2	0.29	0.00	0.24	4	78
640359	Footwear; n.e.c. in heading no. 6403, (not covering the ankle), outer soles and uppers of leather	1520	Manufacture of footwear	7313	9	7	2	0.27	0.00	0.21	3	71
640399	Footwear; n.e.c. in heading no. 6403, (not covering the ankle), outer soles of rubber, plastics or composition leather, uppers of leather	1520	Manufacture of footwear	7313	9	7	2	0.27	0.00	0.21	3	71
300439	Medicaments; containing hormones (but	2120	Manufacture of pharmaceutical preparations	313	166	141	70	0.50	0.00	12.77	14	181

	not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale											
690721	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight not over 0.5%	2331	Manufacture of ceramic tiles and flags	271	73	59	20	0.34	0.04	2.68	24	119
842290	Machinery; parts of machinery of heading no. 8422	2829	Manufacture of other general-purpose machinery n.e.c.	4613	19	17	5	0.28	0.00	0.59	7	97
842230	Machinery; for filling, closing, sealing, capsuling or labelling bottles, cans, bags or other containers, machinery for aerating beverages	2829	Manufacture of other general-purpose machinery n.e.c.	4613	19	17	5	0.28	0.00	0.59	7	97
842240	Machinery; for packing or wrapping	2829	Manufacture of other general-purpose machinery n.e.c.	4613	19	17	5	0.28	0.00	0.59	7	97
890110	Cruise ships, excursion boats and similar vessels,	3011	Building of ships and floating structures	514	35	30	10	0.32	0.00	1.48	15	112

	principally designed for the transport of persons, ferry boats of all kinds											
890392	Motorboats; (other than outboard motorboats), for pleasure or sports, other than inflatable	3012	Building of pleasure and sporting boats	842	11	9	3	0.35	0.00	0.20	10	76
900410	Sunglasses; corrective, protective or other	3250	Manufacture of medical and dental instruments and supplies	15763	3	2	1	0.30	0.00	0.14	6	111

Source: Project Team based on Eurostat data

Table D.19: Description of top Dutch export sectors, 2019

Code HS	*Label HS*	*Code NACE*	*Label NACE*	*N. Firms*	*Avg. N. Employees per firm*	*Avg. N. Employees (FTE) per firm*	*Turnover per firm*	*Turnover per Employee (FTE)*	*Energy over Turnover*	*Gross Margin per firm*	*Investment per Employee*	*Value Added per employee (FTE)*
200410	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen	1031	Processing and preserving of potatoes	27	165	153	121	0.79	0.03	8.91	30	132
190110	Food preparations; of flour, meal, starch, malt extract or milk products, suitable for infants or	1086	Manufacture of homogenised food preparations and dietetic food	66								

	young children, put up for retail sale											
220300	Beer; made from malt	1105	Manufacture of beer	633	9	8						
284420	Uranium; enriched in U235, plutonium, their compounds, alloys dispersions (including cermets), ceramic products and mixtures containing uranium enriched in U235, plutonium or compounds of these products	2013	Manufacture of other inorganic basic chemicals	35	67	65	64	0.99	0.05	19.33	79	397
270799	Oils and other products of the distillation of high temperature coal tar; n.e.c. in heading no. 2707	2014	Manufacture of other organic basic chemicals	97	86	82	181	2.20	0.05	10.12	115	240
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or	2120	Manufacture of pharmaceutical preparations	220	60	55	29	0.53	0.01	5.65	25	187

	prophylactic uses, packaged for retail sale											
902190	Appliances; worn, carried or implanted in the body, to compensate for a defect or disability	2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment	104	45	43					3	
901813	Medical, surgical instruments and appliances; magnetic resonance imaging apparatus	2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment	104	45	43					3	
902214	Apparatus based on the use of x-rays; including radiography or radiotherapy apparatus, for medical, surgical or veterinary uses, not dental uses, excluding computed tomography apparatus	2660	Manufacture of irradiation, electromedical and electrotherapeutic equipment	104	45	43					3	
848620	Machines and apparatus of a kind used solely or principally for the manufacture of semiconductor devices or of	2899	Manufacture of other special-purpose machinery n.e.c.	666	32	31	24	0.79	0.00	6.07	27	294

	electronic integrated circuits											
848690	Machines and apparatus of heading 8486; parts and accessories	2899	Manufacture of other special-purpose machinery n.e.c.	666	32	31	24	0.79	0.00	6.07	27	294
870120	Tractors; road, for semi-trailers	2910	Manufacture of motor vehicles	144	96	94	131	1.40	0.00	5.53	3	126
890392	Motor boats and motor yachts, for pleasure or sports (other than outboard motor boats)	3012	Building of pleasure and sporting boats	782	7	6					33	
902139	Artificial parts of the body; excluding artificial joints	3250	Manufacture of medical and dental instruments and supplies	2055	6	5	1	0.19	0.01	0.14	6	86
902131	Artificial parts of the body	3250	Manufacture of medical and dental instruments and supplies	2055	6	5	1	0.19	0.01	0.14	6	86
901839	Medical, surgical instruments and appliances; catheters, cannulae and the like	3250	Manufacture of medical and dental instruments and supplies	2055	6	5	1	0.19	0.01	0.14	6	86

Source: Project Team based on Eurostat data

Table D.20: Description of top Polish export sectors, 2019

Code HS	***Label HS***	***Code NACE***	***Label NACE***	***N. Firms***	***Avg. N. Employees per firm***	***Avg. N. Employees***	***Turn over***	***Turnover per***	***Energy over Turnover***	***Gross Margin***	***Invest ment per***	***Value Added per***

						(FTE) per firm	*per firm*	*Employee (FTE)*		*per firm*	*Employee*	*employee (FTE)*
020713	Meat and edible offal; of fowls of the species Gallus domesticus, cuts and offal, fresh or chilled	1012	Processing and preserving of poultry meat	324	63	62	14	0.22	0.01	0.81	8	30
180690	Chocolate and other food preparations containing cocoa; n.e.c. in chapter 18	1082	Manufacture of cocoa, chocolate and sugar confectionery	437	55	53	7	0.14	0.02	0.31	9	24
240220	Cigarettes; containing tobacco	1200	Manufacture of tobacco products	26	350	336	245	0.73	0.00	22.84	27	98
270400	Coke and semi-coke; of coal, lignite or peat, whether or not agglomerated; retort carbon	1910	Manufacture of coke oven products	12	143	137	46	0.34	0.02	4.63	24	56
340220	Washing and cleaning preparations; surface-active, whether or not containing soap (excluding those of heading no. 3401), put up for retail sale	2041	Manufacture of soap and detergents, cleaning and polishing preparations	401	25	24	4	0.15	0.01	0.47	10	38
710691	Metals; silver, unwrought, (but not powder)	2441	Precious metals production	129	2	2	0	0.08	0.01	0.00	.2	9
830990	Stoppers; caps and lids, of base metal	2592	Manufacture of light metal packaging	47	122	120	38	0.31	0.03	4.63	6	63
902140	Hearing aids (excluding parts and accessories)	2660	Manufacture of irradiation, electromedical	120	5	5	0	0.09	0.00	0.04	2	29

			and electrotherapeutic equipment									
845011	Washing machines; household or laundry-type, fully-automatic, (of a dry linen capacity not exceeding 10kg)	2751	Manufacture of electric domestic appliances	125	249	242	51	0.21	0.01	4.41	10	38
845121	Drying machines; of a dry linen capacity not exceeding 10kg	2751	Manufacture of electric domestic appliances	125	249	242	51	0.21	0.01	4.41	10	38
870423	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a g.v.w. exceeding 20 tonnes), n.e.c. in item no 8704.1	2910	Manufacture of motor vehicles	151	256	252	103	0.41	0.01	8.70	20	61
890120	Tankers	3011	Building of ships and floating structures	947	6	5	1	0.18	0.01	0.03	2	26
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds	3011	Building of ships and floating structures	947	6	5	1	0.18	0.01	0.03	2	26
890590	Vessels; light, fire-floats, floating cranes and other vessels, the navigability of which is subsidiary to their main function, floating docks	3011	Building of ships and floating structures	947	6	5	1	0.18	0.01	0.03	2	26
890190	Vessels; n.e.c. in heading no. 8901,	3011	Building of ships and	947	6	5	1	0.18	0.01	0.03	2	26

	for the transport of goods and other vessels for the transport of both persons and goods		floating structures									
890399	Yachts and other vessels; for pleasure or sports, rowing boats and canoes, n.e.c. in heading no. 8903, other than inflatable	3012	Building of pleasure and sporting boats	441	17	17	1	0.09	0.01	0.18	4	28
841191	Turbines; parts of turbo-jets and turbo-propellers	3030	Manufacture of air and spacecraft and related machinery	148	133	130	18	0.14	0.01	3.83	7	52
940161	Seats; with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)	3100										
940360	Furniture; wooden, other than for office, kitchen or bedroom use	3101	Manufacture of office and shop furniture	5930	5	5	0	0.07	0.01	0.05	2	21
940350	Furniture; wooden, for bedroom use	3109	Manufacture of other furniture	8160	17	16	1	0.07	0.01	0.12	2	20
940360	Furniture; wooden, other than for office, kitchen or bedroom use	3109	Manufacture of other furniture	8160	17	16	1	0.07	0.01	0.12	2	20

Source: Project Team based on Eurostat data

Table D.21: Description of top Romanian export sectors, 2019

Code HS	*Label HS*	*Code NACE*	*Label NACE*	*N. Firms*	*Avg. N. Employees per firm*	*Avg. N. Employees (FTE) per firm*	*Turnover per firm*	*Turnover per Employee (FTE)*	*Energy over Turnover*	*Gross Margin per firm*	*Investment per Employee*	*Value Added per employee (FTE)*
240399	Tobacco; other than homogenised or reconstituted or smoking	1200	Manufacture of tobacco products	6	292		140.2					
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	1610	Sawmilling and planing of wood	2632	9	9	0.4	0.05	0.04	0.03	4.	9.
440792	Wood; beech (Fagus spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, thicker than 6mm	1610	Sawmilling and planing of wood	2632	9	9	0.4	0.05	0.04	0.03	4.	9
441011	Particle board of wood, whether or not agglomerated with resins or other organic binding substances	1621	Manufacture of veneer sheets and wood-based panels	117	57		9.3					
441012	Oriented strand board (OSB) of wood, whether or not agglomerated with resins or other organic binding substances	1621	Manufacture of veneer sheets and wood-based panels	117	57		9.3					

441860	Wood; posts and beams	1623	Manufacture of other builders' carpentry and joinery	1174	9	9	0.6	0.07	0.03	0.07	3	17
330510	Hair preparations; shampoos	2042	Manufacture of perfumes and toilet preparations	193	9	9	0.6	0.07	0.02	0.09	11	25
720719	Iron or non-alloy steel; semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, other than rectangular or square cross-section	2410	Manufacture of basic iron and steel and of ferro-alloys	38	237	237	41.7	0.18	0.32	-1.68	5	6
722300	Steel, stainless; wire	2434	Cold drawing of wire	3	202		17.6					
848220	Bearings; tapered roller bearings, including cone and tapered roller assemblies	2815	Manufacture of bearings, gears, gearing and driving elements	56	274	273	27.2	0.10	0.03	2.53	11	26
840733	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 250cc but not exceeding 1000c	2910	Manufacture of motor vehicles	23	930		346.6					
870321	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity not over 1000cc	2910	Manufacture of motor vehicles	23	930		346.6					

870331	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity not over 1500cc	2910	Manufacture of motor vehicles	23	930		346.6					
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds	3011	Building of ships and floating structures	227	73	73	3.0	0.04	0.02	0.16	3	18
720449	Ferrous waste and scrap; n.e.c. in heading no. 7204	3811	Collection of non-hazardous waste	850	38	38	1.0	0.03	0.04	0.15	3	12

Source: Project Team based on Eurostat data

Table D.22: Description of top Spanish export sectors, 2019

Code HS	*Label HS*	*Code NACE*	*Label NACE*	*N. Firms*	*Avg. N. Employees per firm*	*Avg. N. Employees (FTE) per firm*	*Turnover per firm*	*Turnover per Employee (FTE)*	*Energy over Turnover*	*Gross Margin per firm*	*Investment per Employee*	*Value Added per employee (FTE)*
020329	Meat; of swine, n.e.c. in item no. 0203.2, froze	1011	Processing and preserving of meat	835	54	52	18	0.35	0.01	1.31	9	57
020322	Meat; of swine, hams, shoulders and cuts thereof, with bone in, frozen	1011	Processing and preserving of meat	835	54	52	18	0.35	0.01	1.31	9	57
020649	Offal, edible; of swine, (other than livers), frozen	1011	Processing and preserving of meat	835	54	52	18	0.35	0.01	1.31	9	57
200570	Vegetable preparations; olives,	1039	Other processing	1181	26	26	7	0.26	0.02	0.54	11	47

	prepared or preserved otherwise than by vinegar or acetic acid, not frozen		and preserving of fruit and vegetables									
150910	Vegetable oils; olive oil and its fractions, virgin, whether or not refined, but not chemically modified	1041	Manufacture of oils and fats	1640	8	8	6	0.78	0.02	0.24	19	64
150990	Vegetable oils; olive oil and its fractions, other than virgin, whether or not refined, but not chemically modified	1041	Manufacture of oils and fats	1640	8	8	6	0.78	0.02	0.24	19	64
220421	Wine; still, in containers holding 2 litres or less	1102	Manufacture of wine from grape	4071	7	7	2	0.28	0.02	0.23	18	69
380892	Fungicides; other than containing goods specified in Subheading Note 1 to this Chapter; put up in forms or packings for retail sale or as preparations or articles	2020	Manufacture of pesticides and other agrochemical products	77	39	38	15	0.40	0.01	1.72	8	98
330300	Perfumes and toilet waters	2042	Manufacture of perfumes and toilet preparations	577	31	30	8	0.28	0.00	1.06	12	80
690722	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight over 0.5% but not over 10%	2331	Manufacture of ceramic tiles and flags	214	76	75	18	0.24	0.10	2.63	23	78

690721	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight not over 0.5%	2331	Manufacture of ceramic tiles and flags	214	76	75	18	0.24	0.10	2.63	23	78
690723	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight over 10%	2331	Manufacture of ceramic tiles and flags	214	76	75	18	0.24	0.10	2.63	23	78
681099	Cement, concrete or artificial stone; articles (other than prefabricated structural components for building or civil engineering), whether or not reinforced, n.e.c. in heading no. 6810	2369	Manufacture of other articles of concrete, plaster and cement	307	7	6	1	0.14	0.03	0.08	5	44
721632	Iron or non-alloy steel; I sections, hot-rolled, hot-drawn or extruded, of a height of 80mm or more (721632)	2410	Manufacture of basic iron and steel and of ferro-alloys	240	96	91	50	0.55	0.07	2.14	17	80
850231	Electric generating sets; wind-powered, (excluding those with spark-ignition or compression-ignition internal combustion piston engines)	2811	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	68	53	52	25	0.48	0.01	1.64	18	82

870332	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity over 1500 but not over 2500cc	2910	Manufacture of motor vehicles	112	641	615	467	0.76	0.00	23.32	30	93
870421	ehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvw not exceeding 5 tonnes), n.e.c. in item no 8704.1	2910	Manufacture of motor vehicles	112	641	615	467	0.76	0.00	23.32	30	93
870331	Vehicles; with only compression-ignition internal combustion piston engine (diesel or semi-diesel), cylinder capacity not over 1500cc	2910	Manufacture of motor vehicles	112	641	615	467	0.76	0.00	23.32	30	93
870321	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity not over 1000cc	2910	Manufacture of motor vehicles	112	641	615	467	0.76	0.00	23.32	30	93

Source: Project Team based on Eurostat data

Table D.23: Description of top Swedish export sectors, 2019

Code HS	Label HS	Code NACE	Label NACE	N. Firms	Avg. N. Employees per firm	Avg. N. Employees (FTE) per firm	Turnover per firm	Turnover per Employee (FTE)	Energy over Turnover	Gross Margin per firm	Investment per Employee	Value Added per employee (FTE)
260112	Iron ores and concentrates; agglomerated (excluding roasted iron pyrites)	0710	Mining of iron ores	9								
220860	Vodka	1101	Distilling, rectifying and blending of spirits	68								
240399	Tobacco; other than homogenised or reconstituted or smoking	1200	Manufacture of tobacco products	23	99	88	44	0.50	0.00	16.63	23	274
440711	Wood; coniferous species, of pine (Pinus spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	1610	Sawmilling and planing of wood	1038	13	12	6	0.51	0.02	0.46	23	98
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	1610	Sawmilling and planing of wood	1038	13	12	6	0.51	0.02	0.46	23	98

470321	Wood pulp; chemical wood pulp, soda or sulphate, (other than dissolving grades), semi-bleached or bleached, of coniferous wood	1711	Manufacture of pulp	13	285	278	183	0.66	0.05	29.73	29	180
481092	Paper and paperboard; multi-ply, coated with kaolin or other inorganic substances only, for non-graphic purposes, n.e.c. in heading no. 4810, in rolls or sheets	1712	Manufacture of paper and paperboard	48	353	339	204	0.60	0.07	26.71	38	154
391390	Polymers, natural and modified natural; in primary forms (excluding alginic acid, its salts and esters)	2016	Manufacture of plastics in primary forms	30	152	147	93	0.63	0.01	17.20	55	206
391400	Ion-exchangers; based on polymers of heading no. 3901 to 3913, in primary forms	2016	Manufacture of plastics in primary forms	30	152	147	93	0.63	0.01	17.20	55	206
300214	Blood, human or animal, antisera, other blood fractions and immunological products; immunological products, mixed, put up in measured doses or in forms or packings for retail sale	2120	Manufacture of pharmaceutical preparations	99								
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for	2120	Manufacture of pharmaceutical preparations	99								

	therapeutic or prophylactic uses, packaged for retail sale											
722540	Steel, alloy; flat-rolled, width 600mm or more, hot-rolled, not in coils	2410	Manufacture of basic iron and steel and of ferro-alloys	32	446	441	188	0.43	0.05	6.28	13	80
720529	Iron or steel, pig iron, spiegeleisen; powders (excluding alloy steel)	2410	Manufacture of basic iron and steel and of ferro-alloys	32	446	441	188	0.43	0.05	6.28	13	80
902720	Chromatographs and electrophoresis instruments	2651	Manufacture of instruments and appliances for measuring, testing and navigation	367	13	13	3	0.26	0.02	0.43	6	109
850239	Electric generating sets; (excluding those with spark-ignition or compression-ignition internal combustion piston engines), other than wind powered	2711	Manufacture of electric motors, generators and transformers	83	12	10	3	0.25	0.00	-0.04	3	73
843143	Boring or sinking machinery; parts of the machinery of item no. 8430.41 or 8430.41	2892	Manufacture of machinery for mining, quarrying and construction	122	75	73	54	0.75	0.00	7.62	9	180
843041	Boring or sinking machinery; self-propelled, n.e.c. in heading no. 8430	2892	Manufacture of machinery for mining, quarrying and construction	122	75	73	54	0.75	0.00	7.62	9	180
870360	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for	2910	Manufacture of motor vehicles	159	385	362	271	0.75	0.00	19.10	21	139

	propulsion, capable of being charged by plugging to external source of electric power											
870120	Tractors; road, for semi-trailers	2910	Manufacture of motor vehicles	159	385	362	271	0.75	0.00	19.10	21	139
870423	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a g.v.w. exceeding 20 tonnes), n.e.c. in item no 8704.1	2910	Manufacture of motor vehicles	159	385	362	271	0.75	0.00	19.10	21	139

Source: Project Team based on Eurostat data

D.3 Grouping of HS6 sectors into wider categories

Table D.24: Grouping of HS6 sectors into wider categories

HS 6	*HS6 Label*	*HS2 macro-group*	*Final aggregation*	*N. of firms*
020322	Meat; of swine, hams, shoulders and cuts thereof, with bone in, frozen	Animal & Animal products	**Animal products**	10
020329	Meat; of swine, n.e.c. in item no. 0203.2, frozen			
020649	Offal, edible; of swine, (other than livers), frozen			
020713	Meat and edible offal; of fowls of the species Gallus domesticus, cuts and offal, fresh or chilled			
040690	Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406			
060110	Plants, live; bulbs, tubers, tuberous roots, corms, crowns and rhizomes, dormant	Vegetable Products	**Vegetable products**	13
060290	Plants, live; n.e.c. in heading no. 0602			
060319	Flowers, cut; flowers and buds of a kind suitable for bouquets or ornamental purposes, fresh, other than roses, carnations, orchids, chrysanthemums or lillies			
100390	Cereals; barley, other than seed			
100590	Cereals; maize (corn), other than seed			
150910	Vegetable oils; olive oil and its fractions, virgin, whether or not refined, but not chemically modified			
180620	Chocolate & other food preparations containing cocoa; in blocks, slabs or bars weighing more than 2kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, content exceeding 2kg	Foodstuffs	**Foodstuffs**	64
190110	Food preparations; of flour, meal, starch, malt extract or milk products, suitable for infants or young children, put up for retail sale			
190219	Food preparations; pasta, uncooked (excluding that containing eggs), not stuffed or otherwise prepared			
200410	Vegetable preparations; potatoes, prepared or preserved otherwise than by vinegar or acetic acid, frozen			
200570	Vegetable preparations; olives, prepared or preserved otherwise than by vinegar or acetic acid, not frozen			
210690	Food preparations; n.e.c. in item no. 2106.10			
220410	Wine; sparkling			

220421	Wine; still, in containers holding 2 litres or less			
220820	Spirits obtained by distilling grape wine or grape marc			
293359	Heterocyclic compounds; containing a pyrimidine ring (whether or not hydrogenated) or piperazine ring in the structure, (other than malonylurea and its derivatives, loprazolam, mecloqualone, methaqualone, zipeprol, and salts thereof) n.e.c. in 2933.5	Chemicals & Allied industries	**Chemicals & Pharmaceuticals**	35
300212	Blood, human or animal, antisera, other blood fractions and immunological products; antisera and other blood fractions			
300214	Blood, human or animal, antisera, other blood fractions and immunological products; immunological products, mixed, put up in measured doses or in forms or packings for retail sale			
300215	Blood, human or animal, antisera, other blood fractions and immunological products; immunological products, put up in measured doses or in forms or packings for retail sale			
300431	Medicaments; containing insulin, for therapeutic or prophylactic uses, packaged for retail sale			
300432	Medicaments; containing corticosteroid hormones, their derivatives or structural analogues (but not containing antibiotics), for therapeutic or prophylactic uses, packaged for retail sale			
300439	Medicaments; containing hormones (but not insulin), adrenal cortex hormones or antibiotics, for therapeutic or prophylactic uses, packaged for retail sale			
300490	Medicaments; consisting of mixed or unmixed products n.e.c. in heading no. 3004, for therapeutic or prophylactic uses, packaged for retail sale			
300610	Pharmaceutical goods; sterile surgical catgut, suture materials, tissue adhesives, laminaria, laminaria tents, absorbable surgical or dental haemostatics, and surgical or dental adhesion barriers			
330300	Perfumes and toilet waters			
330499	Cosmetic and toilet preparations; n.e.c. in heading no. 3304, for the care of the skin (excluding medicaments, including sunscreen or sun tan preparations)			
330510	Hair preparations; shampoos			
340220	Washing and cleaning preparations; surface-active, whether or not containing soap (excluding those of heading no. 3401), put up for retail sale			
381121	Lubricating oil additives; containing petroleum oils or oils obtained from bituminous minerals			
410712	Leather; further prepared after tanning or crusting, including parchment-dressed leather, of bovine (including buffalo) or equine animals,	Raw Hides, Skins, Leather, & Furs	**Clothing and accessories**	12

	without hair on, other than leather of heading 41.14, whole hides and skins, grain splits			
420221	Cases and containers; handbags (whether or not with shoulder strap and including those without handle), with outer surface of leather or of composition leather			
621149	Track suits and other garments n.e.c.; women's or girls', of textile materials n.e.c. in item no. 6211.4 (not knitted or crocheted)	Textiles		
640359	Footwear; n.e.c. in heading no. 6403, (not covering the ankle), outer soles and uppers of leather	Footwear / Headgear		
440711	Wood; coniferous species, of pine (Pinus spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm	Wood & Wood products	**Wood & Wood products**	20
440712	Wood; coniferous species, of fir (Abies spp.) and spruce (Picea spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or finger-jointed, of a thickness exceeding 6mm			
440792	Wood; beech (Fagus spp.), sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, thicker than 6mm			
441011	Particle board of wood, whether or not agglomerated with resins or other organic binding substances			
441012	Oriented strand board (OSB) of wood, whether or not agglomerated with resins or other organic binding substances			
441899	Wood; builders' joinery and carpentry of wood n.e.c. in heading no. 4418, other than of bamboo			
481092	Paper and paperboard; multi-ply, coated with kaolin or other inorganic substances only, for non-graphic purposes, n.e.c. in heading no. 4810, in rolls or sheets			
260112	Iron ores and concentrates; agglomerated (excluding roasted iron pyrites)	Mineral Products	**Metal, stone and mineral products**	33
270799	Oils and other products of the distillation of high temperature coal tar; n.e.c. in heading no. 2707			
271600	Electrical energy			
681099	Cement, concrete or artificial stone; articles (other than prefabricated structural components for building or civil engineering), whether or not reinforced, n.e.c. in heading no. 6810	Stone / Glass		
690721	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight not over 0.5%			
690723	Ceramic tiles; flags and paving, hearth or wall tiles other than those of subheadings 6907.30 and 6907.40, of a water absorption coefficient by weight over 10%			
710691	Metals; silver, unwrought, (but not powder)			

711031	Metals; rhodium, unwrought or in powder form	Metals		
711230	Waste and scrap of precious metal or of metal clad with precious metal; ash containing precious metal or precious metal compounds			
720529	Iron or steel, pig iron, spiegeleisen; powders (excluding alloy steel)			
720719	Iron or non-alloy steel; semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, other than rectangular or square cross-section			
721632	Iron or non-alloy steel; I sections, hot-rolled, hot-drawn or extruded, of a height of 80mm or more			
722300	Steel, stainless; wire			
722540	Steel, alloy; flat-rolled, width 600mm or more, hot-rolled, not in coils			
830210	Hinges; suitable for furniture, doors, staircases, windows, blinds, coachwork, saddlery, trunks, chests, caskets or the like, of base metal			
840733	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 250cc but not exceeding 1000cc	Machinery / Electrical	**Machinery / Electrical**	50
840999	Engines; parts for internal combustion piston engines (excluding spark-ignition)			
841191	Turbines; parts of turbo-jets and turbo-propellers			
841330	Pumps; fuel, lubricating or cooling medium pumps for internal combustion piston engines			
842230	Machinery; for filling, closing, sealing, capsuling or labelling bottles, cans, bags or other containers, machinery for aerating beverages			
842240	Machinery; for packing or wrapping			
842839	Elevators and conveyors; continuous-action, for goods or materials, n.e.c. in item no. 8428.20, 8428.31, 8428.32 or 8428.33			
843041	Boring or sinking machinery; self-propelled, n.e.c. in heading no. 8430			
845011	Washing machines; household or laundry-type, fully-automatic, (of a dry linen capacity not exceeding 10kg)			
847150	Units of automatic data processing machines; processing units other than those of item no. 8471.41 or 8471.49, whether or not containing in the same housing one or two of the following types of unit: storage units, input units or output units			
847590	Machines; parts, of those for assembling electric or electronic lamps, tubes, valves or flash-bulbs, in glass envelopes and manufacturing or hot working glass or glassware			

847780	Machinery; for working rubber or plastics or for the manufacture of products from these materials, n.e.c. in this chapter			
847989	Machines and mechanical appliances; having individual functions, n.e.c. or included in this chapter			
848180	Taps, cocks, valves and similar appliances; for pipes, boiler shells, tanks, vats or the like, including thermostatically controlled valves			
848690	Machines and apparatus of heading 8486; parts and accessories			
850220	Electric generating sets; with spark-ignition internal combustion piston engines			
850239	Electric generating sets; (excluding those with spark-ignition or compression-ignition internal combustion piston engines), other than wind powered			
853669	Electrical apparatus; plugs and sockets, for a voltage not exceeding 1000 volts			
853710	Boards, panels, consoles, desks and other bases; for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage not exceeding 1000 volts			
854720	Insulating fittings; of plastics, for electrical machines, of insulating material only (except minor assembly parts), excluding those of heading no. 8546			
860400	Railway or tramway maintenance or service vehicles; whether or not self-propelled (e.g. workshops, cranes, ballast tampers, trackliners, testing coaches and track inspection vehicles)	Transportation	**Transportation**	36
870120	Tractors; road, for semi-trailers			
870321	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity not over 1000cc			
870323	Vehicles; with only spark-ignition internal combustion reciprocating piston engine, cylinder capacity over 1500 but not over 3000cc			
870360	Vehicles; with both spark-ignition internal combustion reciprocating piston engine and electric motor for propulsion, capable of being charged by plugging to external source of electric power			
870380	Vehicles; with only electric motor for propulsion			
870421	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a gvw not exceeding 5 tonnes), n.e.c. in item no 8704.1			
870423	Vehicles; compression-ignition internal combustion piston engine (diesel or semi-diesel), for transport of goods, (of a g.v.w. exceeding 20 tonnes), n.e.c. in item no 8704.1			
870530	Vehicles; fire fighting vehicles			

870829	Vehicles; parts and accessories, of bodies, other than safety seat belts			
870840	Vehicle parts; gear boxes and parts thereof			
870899	Vehicle parts and accessories; n.e.c. in heading no. 8708			
871000	Tanks and other armoured fighting vehicles; motorised, whether or not fitted with weapons, and parts of such vehicles			
880240	Aeroplanes and other aircraft; of an unladen weight exceeding 15,000kg			
880330	Aircraft and spacecraft; parts of aeroplanes or helicopters n.e.c. in heading no. 8803			
890110	Cruise ships, excursion boats and similar vessels, principally designed for the transport of persons, ferry boats of all kinds			
890392	Motorboats; (other than outboard motorboats), for pleasure or sports, other than inflatable			
900410	Sunglasses; corrective, protective or other	Miscellaneous	**Miscellaneous**	56
901813	Medical, surgical instruments and appliances; magnetic resonance imaging apparatus			
901839	Medical, surgical instruments and appliances; catheters, cannulae and the like			
901890	Medical, surgical or dental instruments and appliances; n.e.c. in heading no. 9018			
902131	Artificial parts of the body			
902140	Hearing aids (excluding parts and accessories)			
902190	Appliances; worn, carried or implanted in the body, to compensate for a defect or disability			
902214	Apparatus based on the use of x-rays; including radiography or radiotherapy apparatus, for medical, surgical or veterinary uses, not dental uses, excluding computed tomography apparatus			
902720	Chromatographs and electrophoresis instruments			
903120	Test benches			
903180	Instruments, appliances and machines; for measuring or checking n.e.c. in chapter 90			
940161	Seats; with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)			
940350	Furniture; wooden, for bedroom use			

940360	Furniture; wooden, other than for office, kitchen or bedroom use	
950300	Tricycles, scooters, pedal cars and similar wheeled toys; dolls' carriages; dolls; other toys; reduced-size (scale) models and similar recreational models, working or not; puzzles of all kinds	
390931	Amino-resins; n.e.c. in heading no. 3909, in primary forms, poly(methylene phenyl isocyanate) (Crude MDI, polymeric MDI)	Plastic / Rubbers
391710	Plastics; artificial guts (sausage casings) of hardened protein or of cellulosic materials	
392690	Plastics; other articles n.e.c. in chapter 39	

Source: Project Team

D.4 Structured questionnaire and implementation plan for the survey

This Annex describes the structure of the survey questionnaire, provides information on how the survey was implemented, and offers details regarding the achieved survey sample.

D.4.1 Survey questionnaire

The questionnaire covers topics that are central to understand the effect of domestic competition on export performance and the development of competition in domestic markets. Firstly, the questionnaire captures in detail the characteristics and export activities of the interviewed company. Secondly, with respect to the main goods and services used as input for the product of the interviewed company, the questionnaire discerns the level and development of competition among suppliers in these upstream markets. Thirdly, the questionnaire includes questions to capture data on domestic competition and its impact on the company's performance in export markets.

The questionnaire has been prepared by the Project Team and, following subsequent iterations, validated by DG Comp. In drafting the questionnaire, the Project Team also benefitted from the input of other stakeholders and experts on competition. With the survey, the Project Team aims to close information gaps about the identified export companies in top export sectors and capture their perception of the market dynamics, while ensuring validity and reliability of the obtained data.

The survey includes overall seven parts:

- export activity of the firm in terms of export product, number of destination countries, regions, competitors in export markets - Section A (first part);
- characteristics of the firm (number of employees, turnover, export markets etc.) - Section A (second part);
- competition in input markets for goods, including questions on source countries for inputs, main characteristics, intensity and evolution of competition - Section B;
- competition in input markets for services, including questions to identify the main input services, importance of price and quality, intensity and evolution of competition- Section C;

- competition in the domestic markets for the production and sale of the export product, including the competitive pressure faced by the company for the sale of the product in the domestic (European) market - Section D;
- impact of domestic competition on performance, including questions on the mechanism how competition in domestic markets affects firm performance - Section E;
- relative importance of competition, a concluding section that measures the importance of competition relative to other factors – Section F.

D.4.2 Implementation of the survey

The survey was conducted via telephone (CATI). The target respondent was the CEO, board level, manager or other type of employee of the firm who is knowledgeable in the export activities of the firm. At the beginning of the interview, respondents were also offered the option to fill in the questionnaire online (in CAWI mode) instead of answering to the questionnaire on the telephone. If respondents chose this option, they were sent an invitation email with a unique link to fill in the survey online.

The universe of the survey included European firms that produce goods belonging to specific product groups ('top export sectors') and that export these goods to non-EU countries (e.g., Switzerland, North America, China, Middle East). The sectors were defined on country level based on available sources of trade data. Per country, around 20 top export sectors were identified. The firms were selected randomly from lists of companies in these sectors on country level. The interviews were expected to take 20 minutes of interview time. The survey was planned to be conducted to cover the 11 Member States of the European Union in the scope of the study.

Overall, the survey aimed to achieve a minimum of 350 interviews across all countries. The target of the survey was to achieve a roughly equal distribution of completed interviews across countries and product groups (sectors). Based on the GDP share, soft targets on the number of interviews per countries were set, with higher targets in countries that account for a higher share of GDP.

The same questionnaire was used in all countries and the questionnaire was translated from the English master file into the main business language of each country. The questionnaire was scripted centrally and scripts in local languages were provided to the country interviewer teams via a centralised CATI infrastructure.

To create a sample frame, we used International Trade Center (ITC) Trade Map which offers metrics about export effectiveness, global demand, viable markets, rivalry among markets, and also encompass a listing of importers and exporters.[364] We used this database to draw a random list of companies in the scope of the survey based on country and product group (sector).

To raise awareness of the survey, we contacted the pre-identified business associations in each country. We asked the business associations to announce to their members that this survey will be taking place and to allow us to use their branding/contact information on the invitation letters, to increase trust and credibility among potential respondents. We reached out to these trade associations in each Member State (around 20-30 per country) in the period between 1 and 8 August 2023 with a dedicated message and

[364] *https://www.trademap.org/Index.aspx*

request letter for support. This notification to the associations was sent around two weeks prior to the planned fieldwork start.

In cases where an email address of respondents was available, we sent an invitation email before the first contact was made via telephone through an interviewer. The invitation email explained the purpose of the survey and contained a link to answer the survey online. Those respondents who did not react to this online invite where called some days later by an interviewer. At the beginning of the telephone interview, respondents had the chance again to receive a link to the online survey if they preferred this over the telephone interview.

Table D.25 below summarises the main elements of the contact strategy to reach potential respondents.

Table D.25: Main elements of the contact strategy

Time relative to initial contact	***Element***
-14 days	Announce via business associations to members that this survey is taking place
-3 days	Send invitation letter to email address of contact in the company (when email address available).
0 days	Initial phone call to reach an eligible respondent in company.
	Pass the gatekeeper and reach a suitable respondent.
	Confirm eligibility and pass on to suitable respondent in company if needed
	When the contact is established, we: ▪ Offer to fill in the questionnaire online, send email with survey link, or ▪ Agree on appointment for telephone interview. During call, we also offer to send an information package via email, including the questionnaire.
+3-28 days	Targeted follow up calls in order to: ▪ Complete interview appointments ▪ Remind respondents that opted for the online questionnaire to participate ▪ Reach respondents that could initially not be reached

Source: Project Team

The fieldwork was conducted from 17 August to 8 September 2023. The first invitation emails to fill in the survey online were sent out to respondents on 17 August. The interviews per telephone commenced in all countries on 21 August. The last telephone interviews were conducted on 4 September. The online survey closed on 8 September.

D.4.3 Achieved survey sample

A total of 398 interviews were conducted with eligible companies across all 11 Member States. The table below summarises the sample sizes that were achieved per country through telephone (CATI) and online (CAWI) interviews.

Table D.26: Survey sample per country

Country	*Telephone*	*Online*	*Total*
Austria	21	2	23
Belgium	20	2	22
Czech Republic	11	0	11
France	41	5	46
Germany	50	5	55
Italy	60	9	69
Netherlands	25	2	27
Poland	27	7	34
Romania	14	2	16
Spain	51	5	56
Sweden	32	7	39
Total	**352**	**46**	**398**

Source: Project Team

The interviews covered all export sectors in the scope of the study with a random distribution within each country.

The overall response rate of the study in telephone mode is 8.1% (RR3), slightly higher than in comparable telephone surveys of businesses.[365] This calculation follows the AAPOR standard definition of basic response rates.[366] The table below shows the response rate per country. The table reports both the response rate 1 (RR1) and response rate 3 (RR3), following the AAPOR standards. The RR1 is calculated as the ratio between completed interviews and all respondents in the sample list that are eligible or where the eligibility is not known. The RR3 includes a factor based on the interview outcomes that estimates the share of eligible respondents among those with unknown eligibility. The RR3 is thus calculated as the ratio between completed interviews and all respondents in the sample list that are eligible plus the estimated share of eligible respondents among those where eligibility is unknown.

[365] *For example, the annual EIB Investment Survey (EIBIS), a yearly telephone survey by the European Investment Bank (EIB) of 13,300 businesses, has a response rate of 4%. technical details availabe at https://www.eib.org/attachments/eibis-methodology-report-en.pdf EU-OSHA's European Survey of Enterprises on New and Emerging Risks (ESENER) reaches a response rate between 11% and 18% among companies with 5 or more employees. The survey undertakes major efforts to motivate firms to participate. Technical details are available online at https://visualisation.osha.europa.eu/esener/en/about-tool*

[366] *https://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf*

Table D.27: Achieved response rates per country

Country	*Austria*	*Belgium*	*Czech Republic*	*France*	*Germany*	*Italy*
Response rate 1 (RR1)	2.9%	3.7%	1.0%	2.1%	2.4%	2.4%
Response rate 3 (RR3)	14.3	9.0%	6.1%	8.9%	9.3%	24.8%
Country	***Netherlands***	***Poland***	***Romania***	***Spain***	***Sweden***	***Total***
Response rate 1 (RR1)	1.6%	2.0%	1.7%	3.6%	2.9%	2.3%
Response rate 3 (RR3)	3.1%	14.8%	6.7%	28.1%	5.1%	8.1%

Source: Project Team

The length of the interviews was on average 26:25 minutes. During fieldwork, quality assurance processes, including monitoring of individual interviews, were maintained to ensure the quality of the collected data.

D.5 Survey questionnaire

Scope: enterprises identified as "exporting firms in leading export sectors" in 11 countries

Notation:

- Answers "Don't know", "Prefer not to say" are always [SPONTANEOUS]

Introduction

IF CATI:

READ OUT: Hello, my name is <*interviewer*> and I am calling from <*survey company*> on behalf of the European Commission. Your business has been selected to participate in a Europe-wide survey on the effects of competition in domestic and European markets on companies like yours.

READ OUT: European policymakers want to have a better understanding of the issues and circumstances faced by enterprises in strong export sectors. This survey is now being conducted across Europe and your input is very important. The responses to the survey will help shape the policy decisions taken by the Directorate General for Competition of the European Commission.

READ IF RESPONDENTS ASK FOR MORE INFORMATION ABOUT THE PROJECT: The European Commission is currently undertaking an economic study to assess the current state of competition in the EU. As part of this study, the Directorate General for Competition of the European Commission has commissioned an external support study from a consortium of firms composed of Lear, E.CA Economics, Fideres, Kantar Public, Prometeia, and the University of East Anglia. Can I email you some more information about the survey?

READ OUT: Your firm has been selected for this survey because, based on public information, we assume that it belongs to a sector that exports heavily outside the EU, or because a relevant trade association has indicated that your firm is a successful exporter of goods in global export markets. INTERVIEWER: PASS GATEKEEPER AND REACH ELIGIBLE RESPONDENT. IF NEEDED, READ INTRODUCTION AGAIN. AGREE APPOINTMENT IF NEEDED.

The interview may be recorded for quality control purposes.

IF CAWI:

SHOW SCREEN: Thank you for taking part in this survey on behalf of the European Commission. Your business has been selected to participate in a Europe-wide survey on the effects of competition in domestic and European markets on companies like yours.

SHOW SCREEN: European policymakers want to have a better understanding of the issues and circumstances faced by enterprises in strong export sectors. This survey is now being conducted across Europe and your input is very important. The responses to the survey will help shape the policy decisions taken by the Directorate General for Competition of the European Commission.

SHOW SCREEN Your firm has been selected for this survey because, based on public information, we assume that it belongs to a sector that exports heavily outside the EU, or because a relevant trade association has indicated that your firm is a successful exporter of goods in global export markets.

[CATI AND CAWI:]

CATI: READ OUT

CAWI: SHOW SCREEN

The questionnaire will take around 15 to 20 minutes. Your answers to this voluntary and anonymous survey will be treated in strict confidence. The survey is used for statistical purposes and results will be published only in aggregate form. For more information on how we collect and use personal data, you may consult [LINK]. Do you agree to take part in the interview?

Yes	1
No [TERMINATE]	2

IF ANSWER 'No' IS SELECTED, THEN END INTERVIEW.

D.5.1 A. Characteristics of the firm and its export activity

QA1. In the period 2019 to 2022, did your company export products to countries outside of the EU?

(SINGLE ANSWER)

Yes	1
No [TERMINATE]	2
Don't know [TERMINATE]	999

IF QA1=2 ("No") OR 999 ("Don't know"), END INTERVIEW.

QA2. What is your role in the firm?

(SINGLE ANSWER)

CATI: READ OUT

CEO	1
Board level (e.g. CFO, COO)	2
Senior management	3
Middle management	4
Other type of employee	5
Prefer not to say [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	997

IF QA2=997 ("Prefer not to say"), END INTERVIEW.

IF SINGLE PRODUCT IS KNOWN FROM SAMPLE LIST, THEN ASK QA3A

CATI**:** READ OUT:

CAWI: SHOW SCREEN

In preparation for this survey, we have used public sources and contacted trade associations in Europe to identify companies that are successful exporters of goods to countries outside the EU. Your company was identified as an exporter of the following product: [EXPORT PRODUCT].

QA3A. Can you confirm that your company is a producer and exporter of this good to countries outside of the EU?

(SINGLE ANSWER)

Yes	1
No	2
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

IF MULTIPLE PRODUCTS ARE KNOWN FROM SAMPLE LIST, THEN ASK QA3B

CATI**:** READ OUT:

CAWI: SHOW SCREEN

In preparation for this survey, we have used public sources and contacted trade associations in Europe to identify companies that are successful exporters of goods to countries outside the EU. Your company was identified as an exporter of the following products: [LIST OF EXPORT PRODUCTS].

QA3B. In 2019-2022, which of these products was the main product that your company produced and exported, in other words accounted for the largest share of exports outside the EU in terms of turnover?

CATI**:** SELECT FROM LIST

Main product	[LIST OF PRODCUTS]
None of the mentioned [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	998
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

IF ANSWER 'No' (CODE 2) OR 'Don't know' (CODE 999) IN QA3A OR ANSWER 'None of the mentioned' (CODE 998) OR 'Don't know' (CODE 999) IN QA3B, THEN ASK QA3C.

QA3C. In 2019-2022, which other product, if any, was the main product that your company produced and exported to countries outside of the EU?

(OPEN ANSWER)

CAWI**:** Please note down your answer**.**

Main product	_____
None [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]] [TERMINATE]	998
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]] [TERMINATE]	999

IF ANSWER 'None' (CODE 998) OR 'Don't know' (CODE 999) IN QA3C, THEN END INTERVIEW

ASK ALL

CATI: READ OUT/CAWI: SHOW SCREEN

The following questions are about this specific product your company exports.

QA4. To which international markets did your company export this product during the period 2019 to 2022?

(MULTIPLE ANSWERS POSSIBLE – ROTATE - CODE 998, 999 EXCLUSIVE)

CATI: MULTIPLE ANSWERS POSSIBLE – READ OUT

CAWI: Please select all that apply

Countries of the European Union [TERMINATE IF SELECTED EXCLUSIVELY]	1
Other European countries outside the EU (e.g., Switzerland, the United Kingdom, Russia)	2
North America	3
Latin America and the Caribbean	4

China	5
Rest of Asia and the Pacific	6
Middle East and Africa	7
None of the above [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]] [TERMINATE]	998
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]] [TERMINATE]	999

IF ANSWER 'None of the above' (CODE 998) OR 'Don't know' (CODE 999) OR ONLY 'Countries of the European Union' (CODE 1), THEN END INTERVIEW.

QA5. To approximately how many countries outside the EU did your company export this product in any given year during the period 2019 to 2022?

If the number of destination countries changed during this period, please consider the year with the largest number of destination countries.

(SINGLE ANSWER)

CATI: READ OUT

Between 1 and 5	1
Between 6 and 20	2
More than 20	3
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QA6. Thinking about the sales of this product in the **main market outside the EU** to which you export it, how many companies do you regard as credible competitors in this market?

(SINGLE ANSWER PER LINE – ROTATE ITEMS)

CATI: READ OUT

	0	1	2	3	4	5	6 to10	11 to 20	More than 20	Don't know [CATI: DO NOT READ OUT]
Competitors from [COUNTRY]	1	2	3	4	5	6	7	8	9	999

Competitors from other EU countries	1	2	3	4	5	6	7	8	9	999
Competitors from countries outside the EU	1	2	3	4	5	6	7	8	9	999

CATI: READ OUT: Now I would like to ask you a few general questions about your company.

CAWI: SHOW SCREEN: Now we would like to ask you a few general questions about your company.

QA7. Approximately how many employees does your company have?

(SINGLE ANSWER)

CATI: READ OUT

Less than 10	1
Between 10 and less than 50	2
Between 50 and less than 250	3
Between 250 and less than 1,000	4
Between 1,000 and less than 5000	5
More than 5000	6
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QA8. To which turnover bracket does your company belong? Please base your answer on your company's turnover in the last year.

(SINGLE ANSWER)

CATI: READ OUT

500,000 euros or less	1
More than 500,000 and up to 2 million euros	2
More than 2 million and up to 10 million euros	3
More than 10 million and up to 50 million euros	4
More than 50 million euros and up to 250 million euros	5

More than 250 million euros and 5 billion euros	6
More than 5 billion euros	7
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QA9. How old is your company?

(SINGLE ANSWER)

CATI: READ OUT

Less than 10 years old	1
Between 10 and 50 years old	2
More than 50 years old	3
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

D.5.2 B. Competition in input markets for goods

CATI: READ OUT: You mentioned that your company exports the following good: [EXPORT PRODUCT]. I would now like to ask some questions about the input products used for its production.

CAWI: SHOW SCREEN: You mentioned that your company exports the following good: [EXPORT PRODUCT]. We would now like to ask some questions about the input products used for its production.

CATI: READ OUT/CAWI: SHOW SCREEN:

Please think about the most important input your company needs to buy to manufacture this product. Do not count services as inputs, only physical goods. An input is important if it has a big impact on the competitiveness of the final product. Possible inputs may range from basic raw materials to highly complex components.

QB1. What is the main input your company procures to produce this product?

(OPEN ANSWER)

CAWI**:** Please note down your answer**.**

Main input	_____
Production does not require a physical input [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	2
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

ADAPTED IF QB1 = 2 OR 999 skip to QC1

QB2. Where do you mainly procure this input?

(SINGLE ANSWER - ROTATE)

CATI: READ OUT

In [COUNTRY]	1
In another EU country	2
In a country outside the EU	3
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

IF QB2 = 3 ("country outside the EU") OR QB2 = 999 ("Don't know"), skip to QC1

QB3a. Thinking about the main input needed to manufacture the product, which aspect of this input is most important in enabling your company to be successful on global export markets? Firstly?

The code which was selected in QB3a should be skipped in QB3b

If code 996 was selected in QB3a, then show QB3b. If codes 998 or 999 were selected, then do not show QB3b

QB3b. And then?

(FIRST SINGLE ANSWER – THEN MULTIPLE ANSWERS POSSIBLE UP TO 2 – ROTATE 1-4)

CATI: READ OUT

Price	1
Product quality	2
Product variety	3
Product innovation	4
Other [Specify: _____] [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	996
None [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	998
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

ASK QB4 AND QB5 FOR EACH ANSWER IN QB3.

Ask this loop only for the standard items in QB3a+b when they were selected. No need to ask it for the "Other" option

CATI: READ OUT/CAWI: SHOW SCREEN

You mentioned that the following aspect of the input is important: [ANSWER IN QB3].

QB4. How intense is the current level of competition **on this aspect** among suppliers of the input? Please answer on a scale from 0 to 10, where 0 means "not intense at all" and 10 means "very intense".

(SINGLE ANSWER)

leave 'on this aspect' term and pipe the aspect in brackets

Not intense at all										Very intense	Don't know	Not appl.
0	1	2	3	4	5	6	7	8	9	10	999	995

QB5. Compared with 10 years ago, how has the level of competition **on this aspect** among suppliers of this input changed, if at all?

(SINGLE ANSWER)

leave 'on this aspect' term and pipe the aspect in brackets

CATI: READ OUT

Increased	1
Remained stable	2
Decreased	3
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

D.5.3 C. Competition in input markets for services

CATI: READ OUT: Now I would like to ask about services that are relevant in enabling your company to produce and sell this product. Please keep in mind that the questions refer to the main export product: [EXPORT PRODUCT].

CAWI: SHOW SCREEN: Now we would like to ask about services that are relevant in enabling your company to produce and sell this product. Please keep in mind that the questions refer to the main export product: [EXPORT PRODUCT].

QC1. How important are the following types of services in enabling your company to produce and sell this product competitively in global export markets?

(SINGLE ANSWER PER LINE– ROTATE ITEMS)

CATI: READ OUT

	Very important	Somewhat important	Not very important	Not important at all	Don't know [CATI: DO NOT

					READ OUT]
IT and communication services (e.g. broadband, mobile telephony) CATI: READ BRACKETS IF NEEDED	4	3	2	1	999
Energy	4	3	2	1	999
Transport and logistics	4	3	2	1	999
Financial services	4	3	2	1	999
Professional services (e.g. legal, audit, tax) CATI: READ BRACKETS IF NEEDED	4	3	2	1	999
Creative inputs (e.g., design, artistic) CATI: READ BRACKETS IF NEEDED	4	3	2	1	999
Research and development services	4	3	2	1	999
Other (please specify: _____) CATI show on the same page with [DO NOT READ OUT]	4	3	2	1	999

IF MORE THAN 2 ITEMS RECEIVED ANSWERS 'very important' IN QC1 THEN ASK QC1b.

QC1b.You mentioned that several types of services are very important for your company. Which of these are most important? Please name up to two services.

(MAX 2 ANSWERS)

CATI: READ OUT

[ITEMS WITH 'very important' FROM QC1]	
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

ASK QC2-QC5 FOR EACH ITEM EXCEPT "OTHER" DESCRIBED AS 'very important' IN QC1.IF MORE THAN 2 ITEMS WERE DESCRIBED AS 'very important' IN QC1, THEN ASK QC2-QC5 FOR EACH ANSWER IN QC1b.

QC2. To what extent is the **competitive pricing** of [SERVICE] important to the competitiveness of your company in global export markets?

(SINGLE ANSWER)

CATI: READ OUT

Very important	4
Somewhat important	3
Not very important	2
Not important at all	1
Neither [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	5
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QC3. To what extent is the **high quality** of [SERVICE] important to the competitiveness of your firm in global export markets?

(SINGLE ANSWER)

CATI: READ OUT

Very important	4
Somewhat important	3
Not very important	2
Not important at all	1
Neither [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	5
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QC4. How intense is the current level of competition for [SERVICE]? Please answer on a scale from 0 to 10, where 0 means "not intense at all" and 10 means "very intense".

(SINGLE ANSWER)

Not intense at all										Very intense	Don’t know	Not appl.
0	1	2	3	4	5	6	7	8	9	10	999	995

QC5. Compared with 10 years ago, how has the level of competition among suppliers for [SERVICE] changed, if at all?

(SINGLE ANSWER)

CATI: READ OUT

Increased	1
Remained stable	2
Decreased	3
Don’t know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

"[SERVICE]" in QC4 and QC5 - pipe in the answers from QC1

D.5.4 D. Competition in domestic markets for the production and sale of the export product

CATI: READ OUT: Now I would like to ask a few questions about the sales of your main export product in the domestic market. By domestic market, we mean the market for the sale of the product to customers in [COUNTRY] and, if relevant, to customers in other EU countries.

CAWI: SHOW SCREEN: Now we would like to ask a few questions about the sales of your main export product in the domestic market. By domestic market, we mean the market for the sale of the product to customers in [COUNTRY] and, if relevant, to customers in other EU countries.

QD1. Thinking about the sales of this product in the domestic market, how many companies do you regard as credible competitors in this market?

(SINGLE ANSWER)

CATI: READ OUT IF NEEDED

0	1
1	2
2	3
3	4
4	5
5	6
6 to 10	7
11 to 20	8
More than 20	9
Don’t know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QD2a. What is the most important aspect of this product in enabling your company to be successful in the domestic market? Firstly?

QD2b. And then?

(FIRST SINGLE ANSWER – THEN MULTIPLE ANSWERS POSSIBLE UP TO 2 – ROTATE 1-4)

CATI: READ OUT

Price	1
Product quality	2

Product variety	3
Product innovation	4
Other [Specify: _____] [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	996
None [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	998
Don’t know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

ASK QD3 AND QD4 FOR EACH ANSWER IN QD2 EXCEPT "OTHER".

Don't show QD2b if QD2a=998/999

CATI: READ OUT/CAWI: SHOW SCREEN

You mentioned that this aspect of the product is important for success in the domestic market: [ANSWER IN QD2].

QD3. How intense is the current level of competition **on this aspect** in the domestic market for this product? Please answer on a scale from 0 to 10, where 0 means “not intense at all” and 10 means “very intense”.

(SINGLE ANSWER)

leave 'on this aspect' term and pipe the aspect in brackets

Not intense at all										Very intense	Don’t know	Not appl.
0	1	2	3	4	5	6	7	8	9	10	999	995

QD4. Compared with 10 years ago, how has the level of competition in the domestic market **on this aspect** changed, if at all?

(SINGLE ANSWER)

leave 'on this aspect' term and pipe the aspect in brackets

CATI: READ OUT

Increased	1
Remained stable	2
Decreased	3
Don’t know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

D.5.5 E. Impact of domestic competition on performance in domestic and global export markets

QE1. To what extent, if at all, does the intensity of competition in the domestic market for your main export product influence decisions in your business when it comes to the following aspects? Please answer on a scale from 1 to 5, where 1 means "not at all" and 5 means "to a great extent".

(SINGLE ANSWER PER LINE – ROTATE ITEMS)

	1 Not at all	2	3	4	5 To a great extent	Don't know
Price	1	2	3	4	5	999
Quality	1	2	3	4	5	999
Volume of output	1	2	3	4	5	999
Range of product variants	1	2	3	4	5	999
Other (please specify: _____) CATI show on the same page with [DO NOT READ OUT]	1	2	3	4	5	999

QE2. When it comes to your company's performance in export markets for this product, do you think that the competitive pressure your company faces in the domestic market has generally …?

(SINGLE ANSWER – ROTATE)

CATI: READ OUT

Improved the company's performance in export markets	1
Worsened the company's performance in export markets	2
Had no impact on performance in export markets	3
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

IF QE2 = 1 ('Improved performance') proceed to QE3

IF QE2 = 2 ('Worsened performance') proceed to QE4

QE3. You mentioned that competitive pressure in the domestic market has improved your company's performance in export markets for this product. Could you explain how competition has improved this performance?

(OPEN ANSWER)

CAWI: Please note down your answer.

Reasoning	_____
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QE4. You mentioned that competitive pressure in the domestic market has worsened your company's performance in export markets for this product. Could you explain how competition has worsened this performance?

(OPEN ANSWER)

CAWI: Please note down your answer.

Reasoning	_____
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

QE5. To what extent do you agree or disagree with the following statements?

(SINGLE ANSWER PER LINE – RANDOMISE ITEMS)

CATI: READ OUT

	Totally agree	Tend to agree	Tend to disagree	Totally disagree	Don't know [CATI: DO NOT READ OUT]
Competition in domestic markets has increased innovation at our company	4	3	2	1	999
Competition in domestic markets incentivises us to improve or maintain product quality	4	3	2	1	999
Competition in domestic markets incentivises us to increase efficiency	4	3	2	1	999
Competition in domestic markets curbs the size of our domestic operations	4	3	2	1	999

which prevents us from being more successful in export markets					

D.5.6 F. Concluding question

CATI: READ OUT: As a final question, I would like to ask you how important certain factors in your home country are for your company's success in export markets. This question refers again to your main export product.

CAWI: SHOW SCREEN: As a final question, we would like to ask how important certain factors in your home country are for your company's success in export markets. This question refers again to your main export product.

QF1. Overall, how important or not are the following factors in [COUNTRY] for your competitiveness in global export markets for this product?

(SINGLE ANSWER PER LINE – ROTATE ITEMS)

CATI: READ OUT

	Very important	Somewhat important	Neither important nor unimportant	Not very important	Not important at all	Don't know [CATI: DO NOT READ OUT]
Competitive markets for the supply of physical inputs for production	5	4	3	2	1	999
Competitive markets for the supply of services	5	4	3	2	1	999
Domestic competition for the production and sale of this product	5	4	3	2	1	999
Workforce skills and qualifications	5	4	3	2	1	999
Labour costs	5	4	3	2	1	999

Effective legal and administrative system	5	4	3	2	1	999
Transport infrastructure	5	4	3	2	1	999
Communications infrastructure (e.g., broadband, mobile telephony) CATI: READ BRACKETS IF NEEDED:	5	4	3	2	1	999

D.5.7 G. Outro

CATI: READ OUT/CAWI: SHOW SCREEN:

Only a few last questions remain

QG1. Would you like to receive a copy of the final report once it is published?

(SINGLE ANSWER)

Yes	1
No	2
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

IF QG1 = 1 ('YES') proceed to QG2. Else go to QG3.

QG2. CATI READ OUT

: Could you tell me your email address?

CAWI: Could you tell your email address?

(OPEN ENDED)

Email address	_____
Prefer not to say [PN: CATI show on the same page with [DO NOT READ OUT]]	997

QG3. We may wish to contact some respondents to this survey via email if we have additional questions. These questions are for the sole purpose of this study. Would you agree that we may contact you for this reason in the future?

(SINGLE ANSWER)

Yes	1
No	2
Don't know [PN: CAWI [SPONTANEOUS]; CATI show on the same page with [DO NOT READ OUT]]	999

IF ANSWER IS 'YES' IN QG3 AND EMAIL NOT PROVIDED IN QG2 THEN ASK QG4

QG4. CATI: Could you tell me your email address?

CAWI: Could you tell your email address?

(OPEN ENDED)

Email address	_____
Prefer not to say [PN: CATI show on the same page with [DO NOT READ OUT]]	997

QG5. Finally, we would like to link some information from the survey with a European business data base. Do you know your Company ID and would you be willing to provide it?

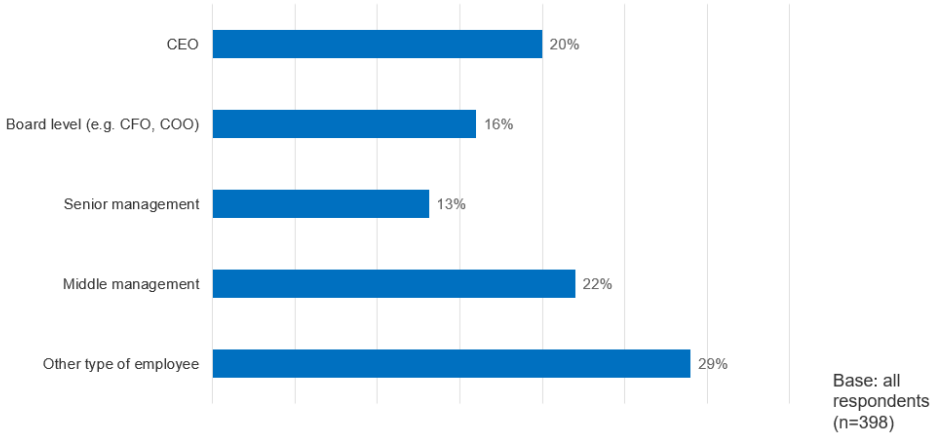
(OPEN ENDED)

Company ID	_____
Prefer not to say [PN: CATI show on the same page with [DO NOT READ OUT]]	997
Don't know [PN: CATI show on the same page with [DO NOT READ OUT]]	999

D.6 Survey results

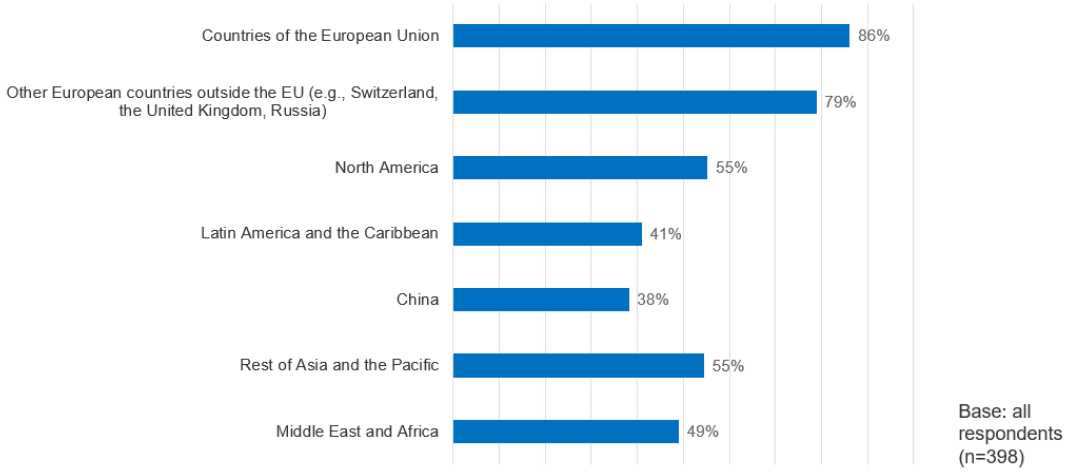
D.6.1 Characteristics of respondents

Figure D.1: Position in company of person answering



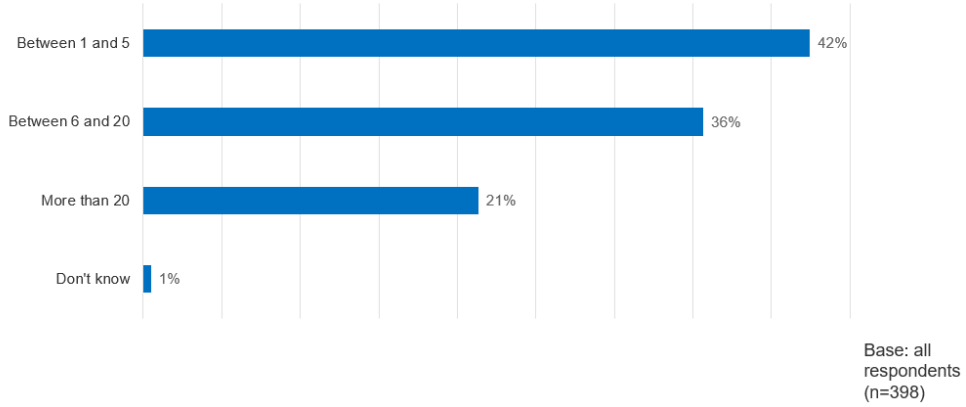
Source: Project Team

Figure D.2: International markets to which the company exports



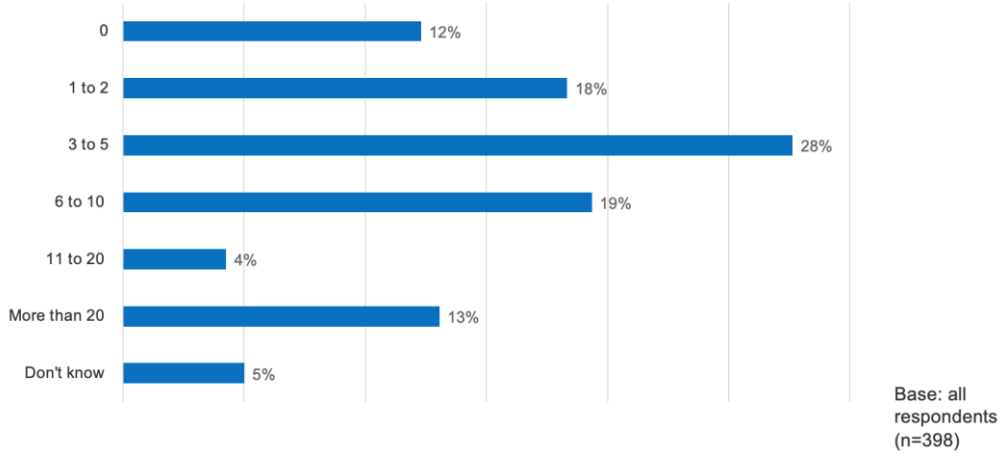
Source: Project Team

Figure D.3: Number of countries outside the EU to which the company exports



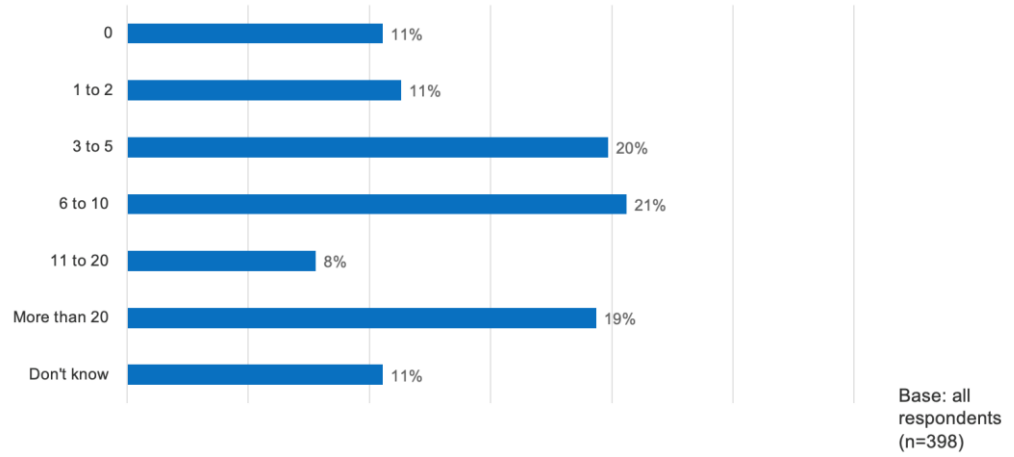
Source: Project Team

Figure D.4: Number of credible competitors in the main non-EU market - competitors from (COUNTRY)



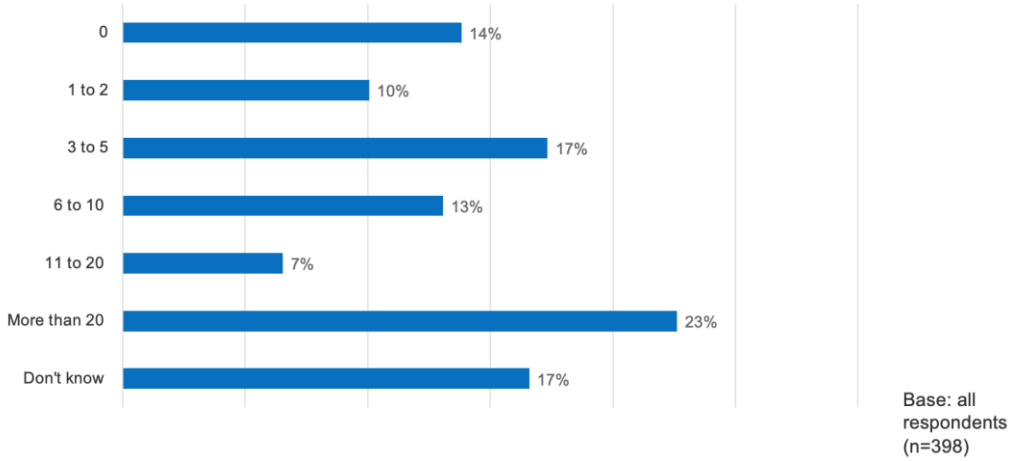
Source: Project Team

Figure D.5: Number of credible competitors in the main non-EU market - competitors from other EU countries



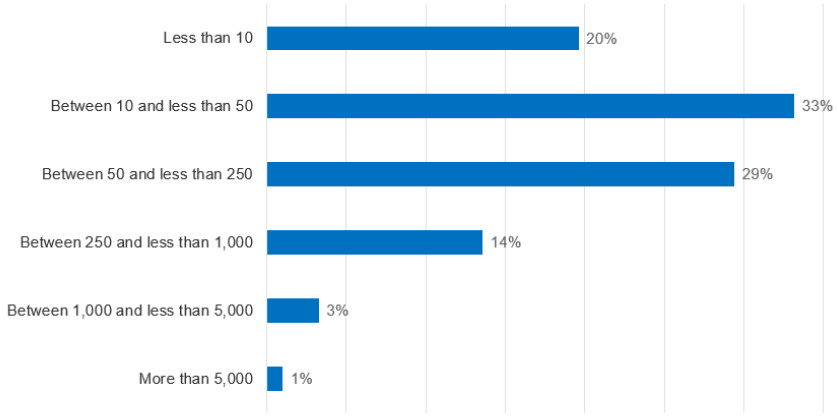
Source: Project Team

Figure D.6: Number of credible competitors in the main non-EU market - competitors from non-EU countries



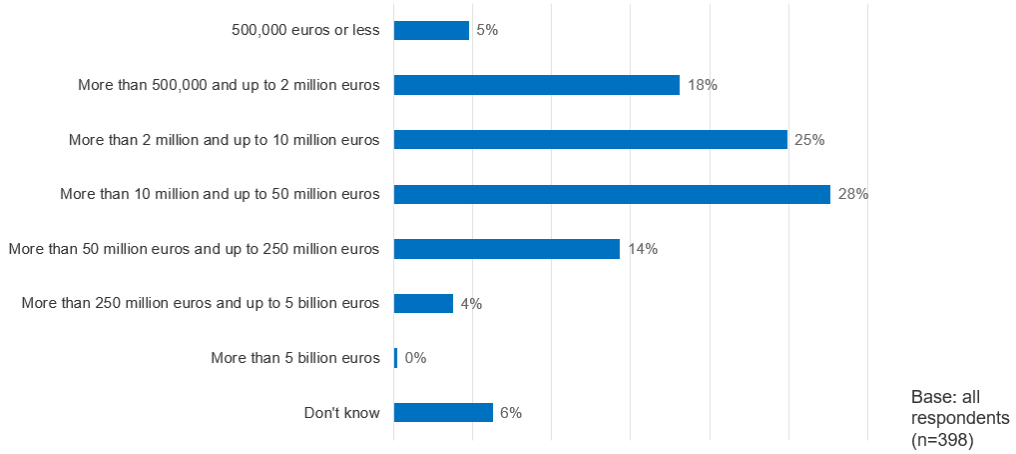
Source: Project Team

Figure D.7: Number of employees



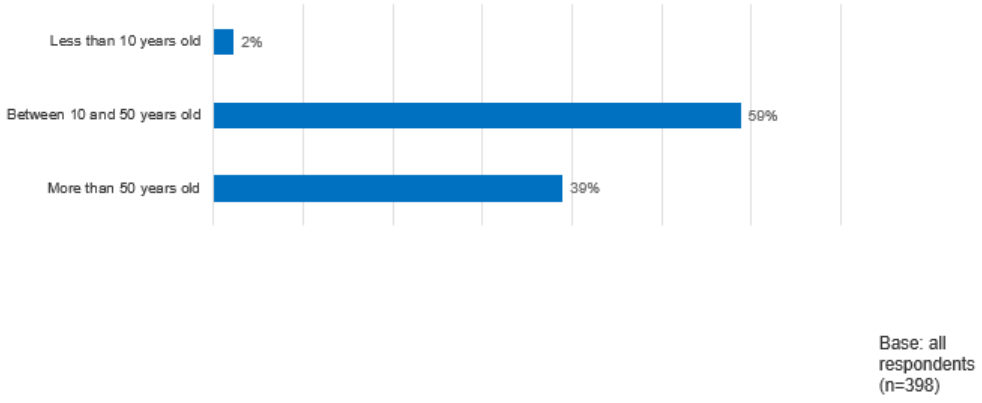
Source: Project Team

Figure D.8: Turnover in the previous year



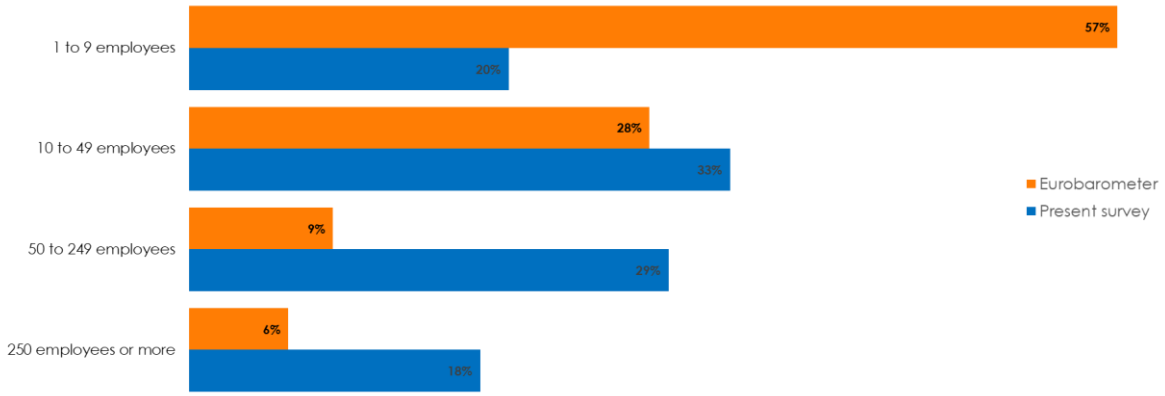
Source: Project Team

Figure D.9: Age of the companies



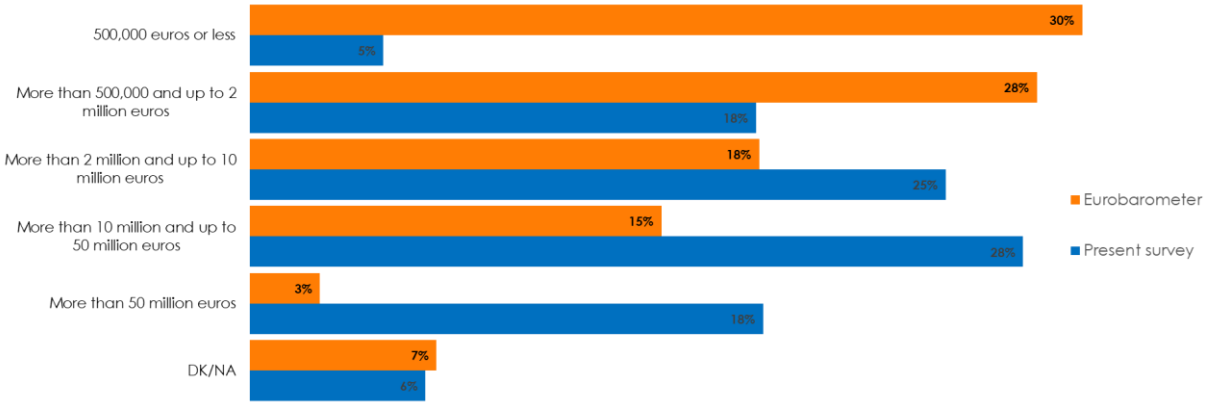
Source: Project Team

Figure D.10: Comparison of firms' number of employees



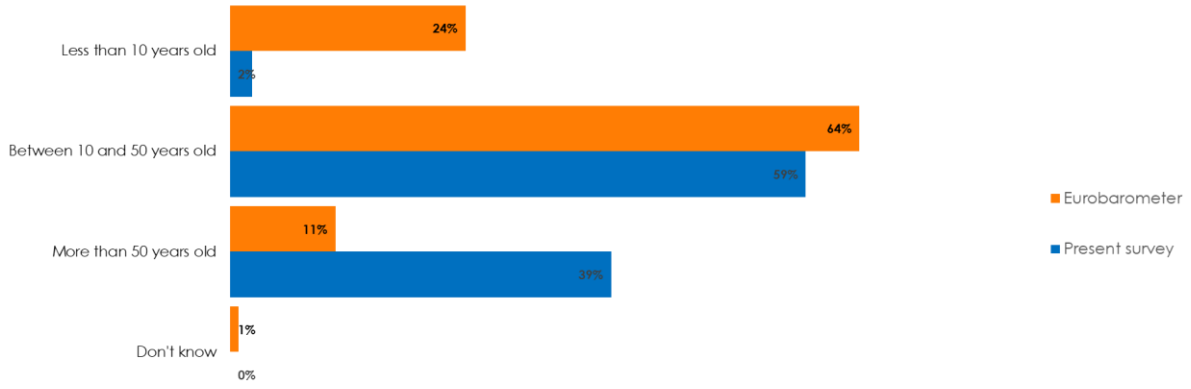
Source: Project Team based on current survey and Flash Eurobarometer 486 data

Figure D.11: Comparison of firms' turnover



Source: Project Team based on current survey and Flash Eurobarometer 486 data

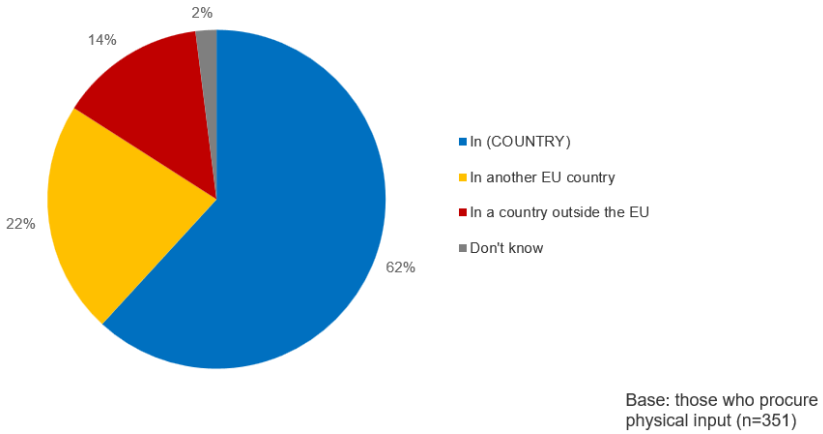
Figure D.12: Comparison of firms' age



Source: Project Team based on current survey and Flash Eurobarometer 486 data

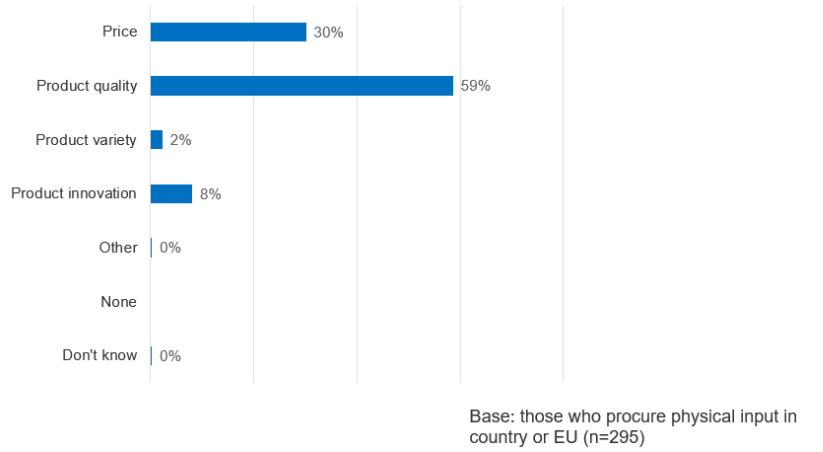
D.6.2 Input markets for goods

Figure D.13: Place of procurement of the main input



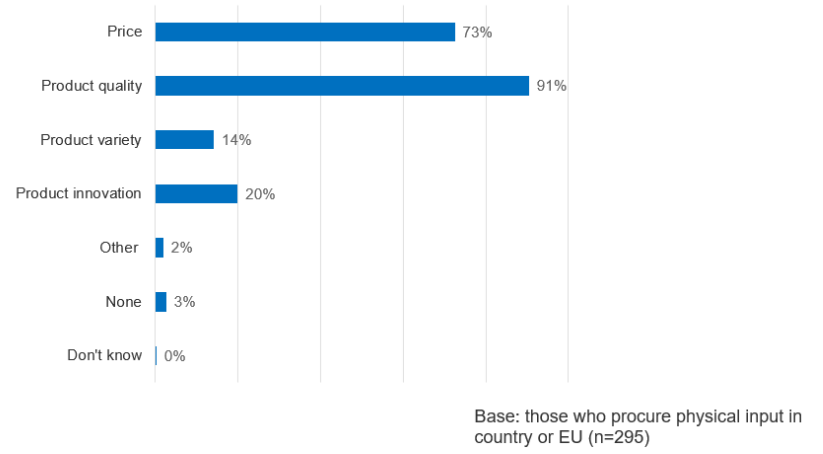
Source: Project Team

Figure D.14: Most important aspect of the main input for success in global export markets



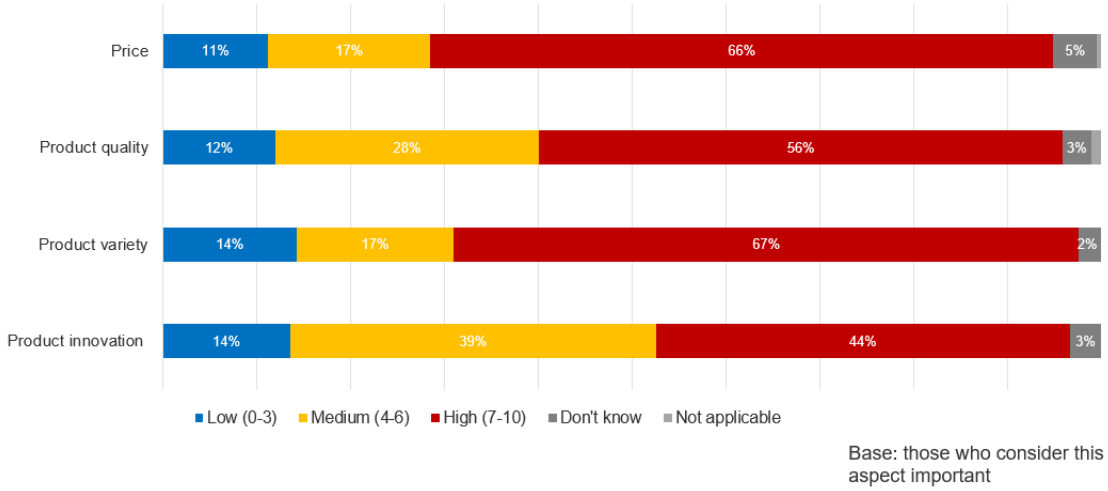
Source: Project Team

Figure D.15: Most mentioned aspects of the main input that are important for success in global export markets



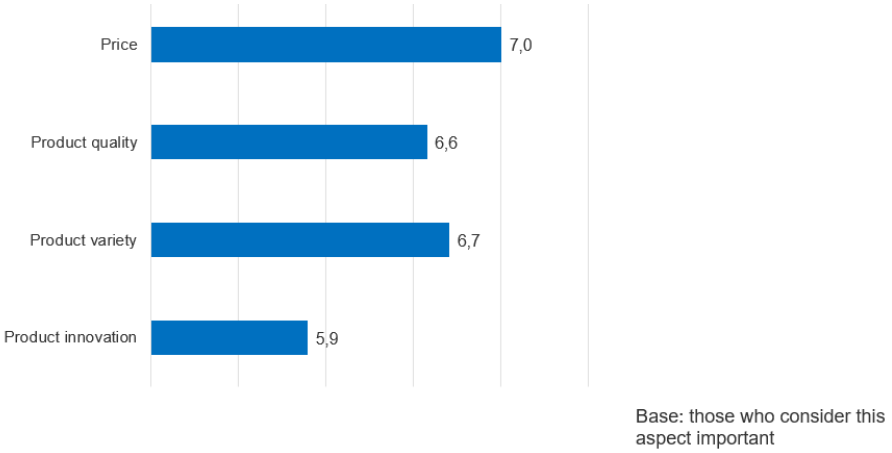
Source: Project Team

Figure D.16: Intensity of competition on the different aspects



Source: Project Team

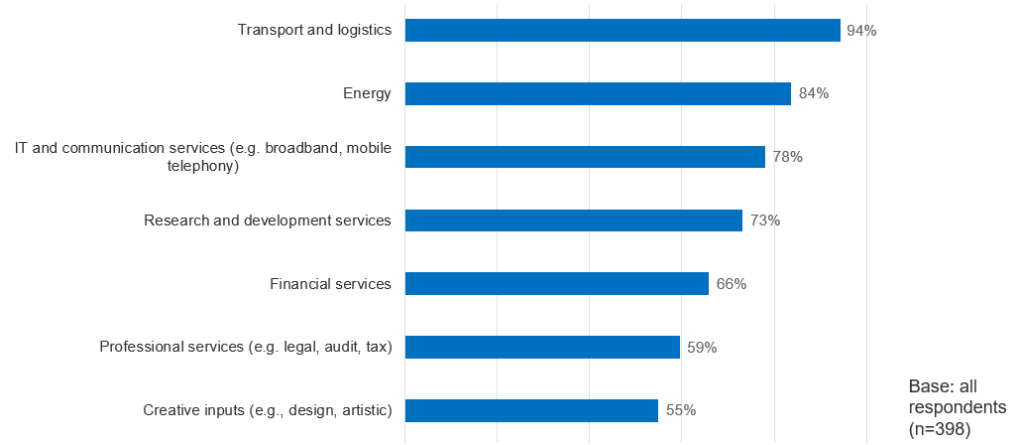
Figure D.17: Intensity of competition on the different aspects (average scores on scale 0-10)



Source: Project Team

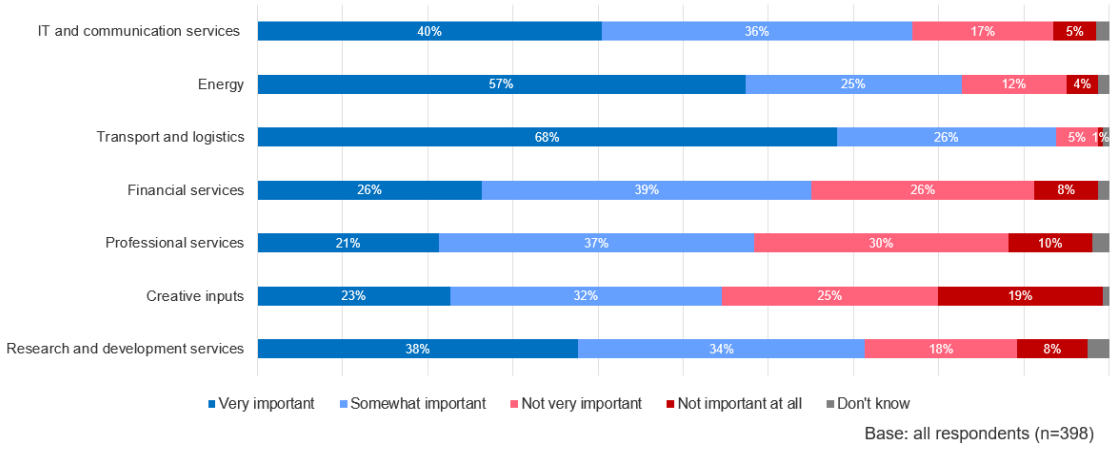
D.6.3 Input markets for services

Figure D.18: Perceived importance of upstream services – total importance



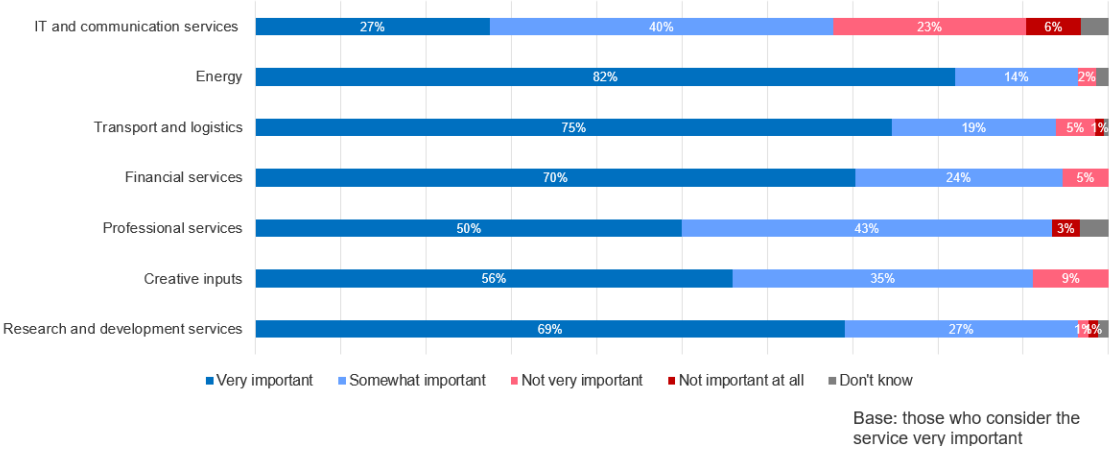
Source: Project Team

Figure D.19: Perceived importance of upstream services



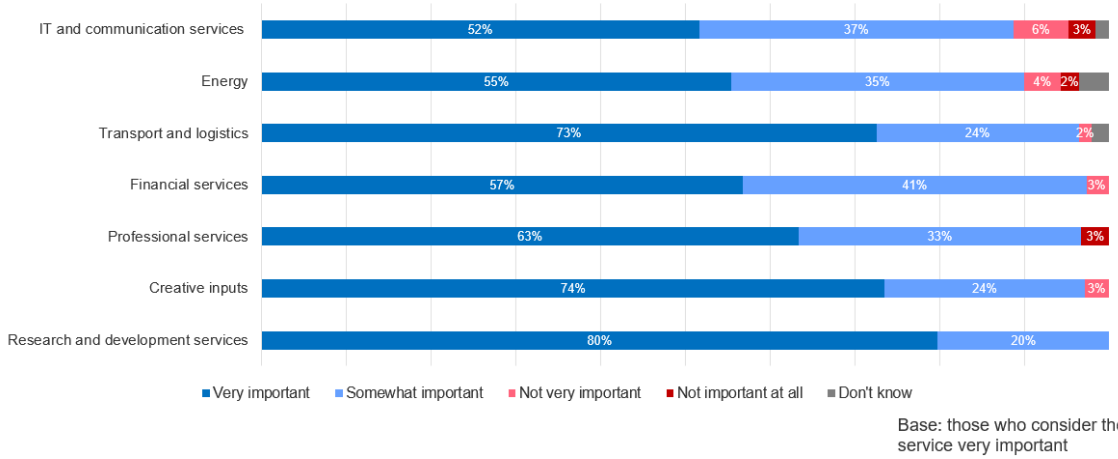
Source: Project Team

Figure D.20: Importance of competitive pricing of upstream services



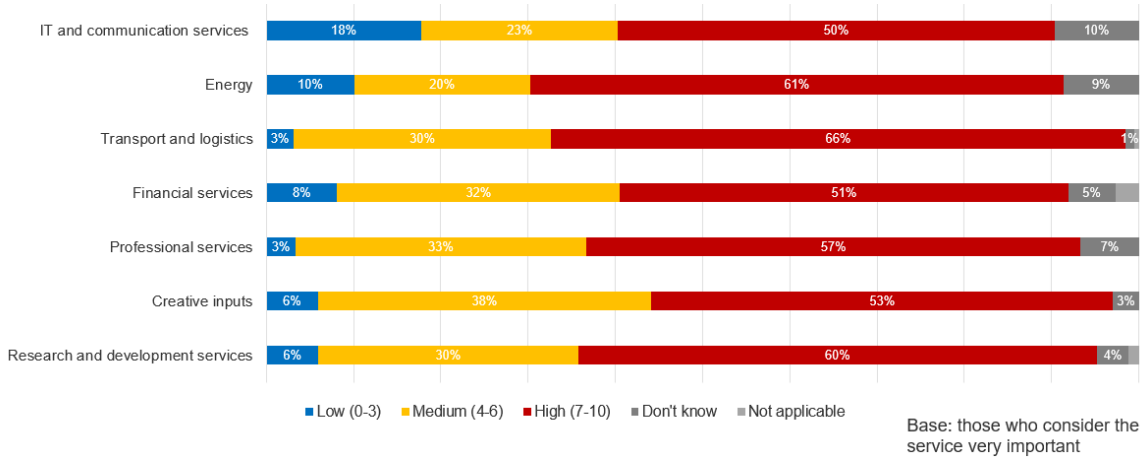
Source: Project Team

Figure D.21: Importance of high quality of upstream services



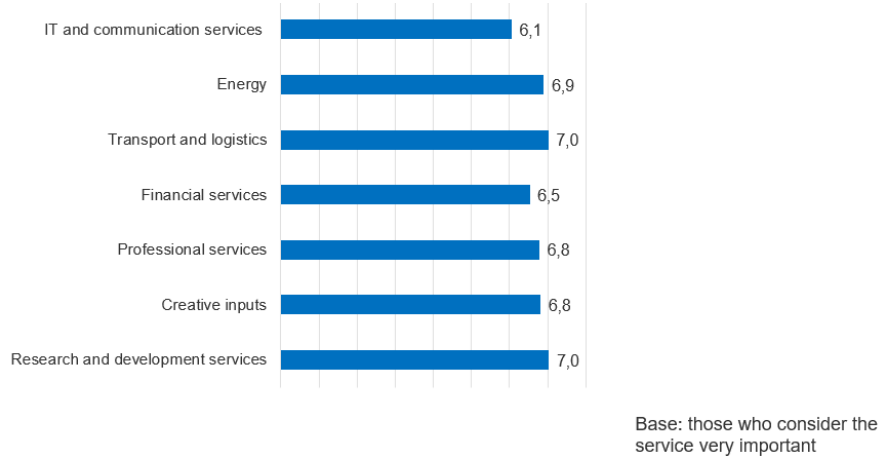
Source: Project Team

Figure D.22: Intensity of competition in market for upstream services



Source: Project Team

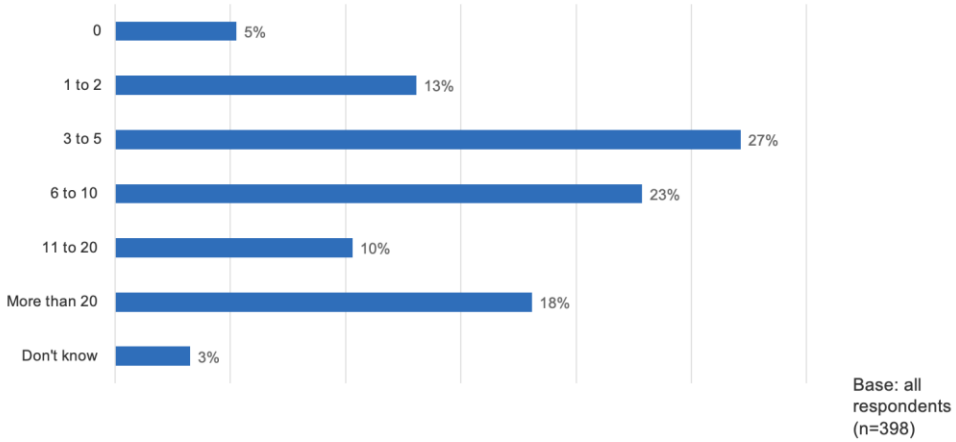
Figure D.23: Intensity of competition in market for upstream services (average scores on scale 0-10)



Source: Project Team

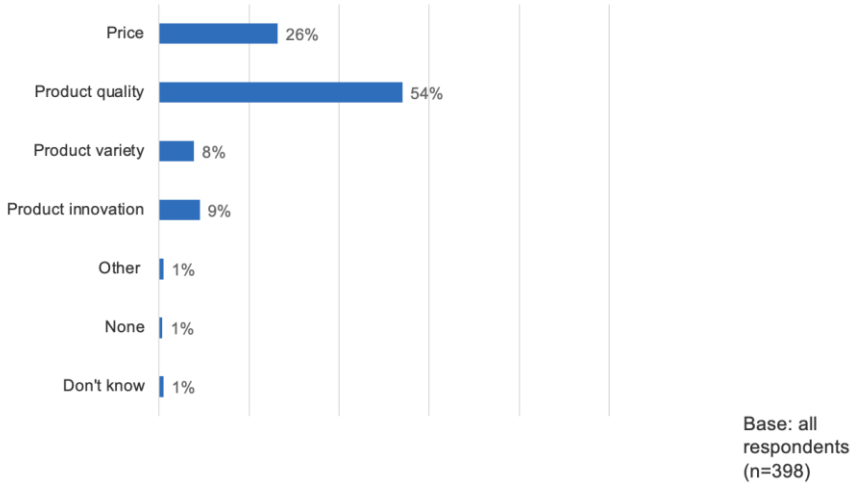
D.6.4 Domestic market for export products

Figure D.24: Number of credible competitors in the domestic market



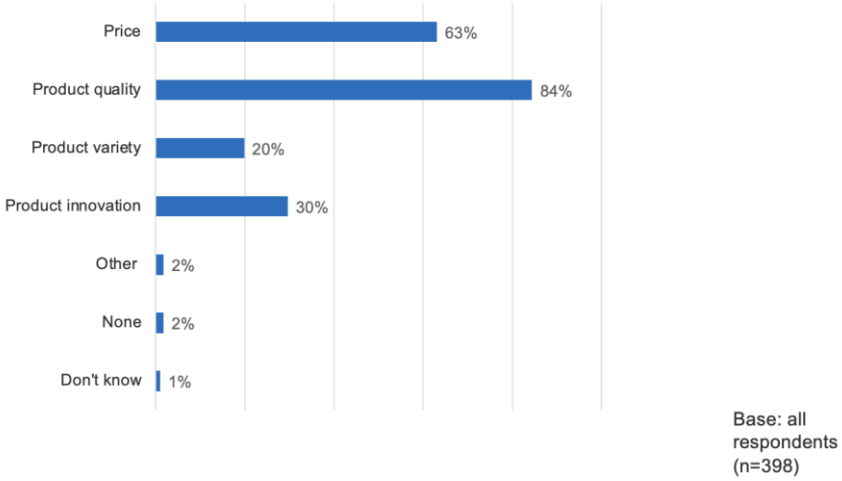
Source: Project Team

Figure D.25: Top mentioned aspect of the product that is important for success in domestic markets



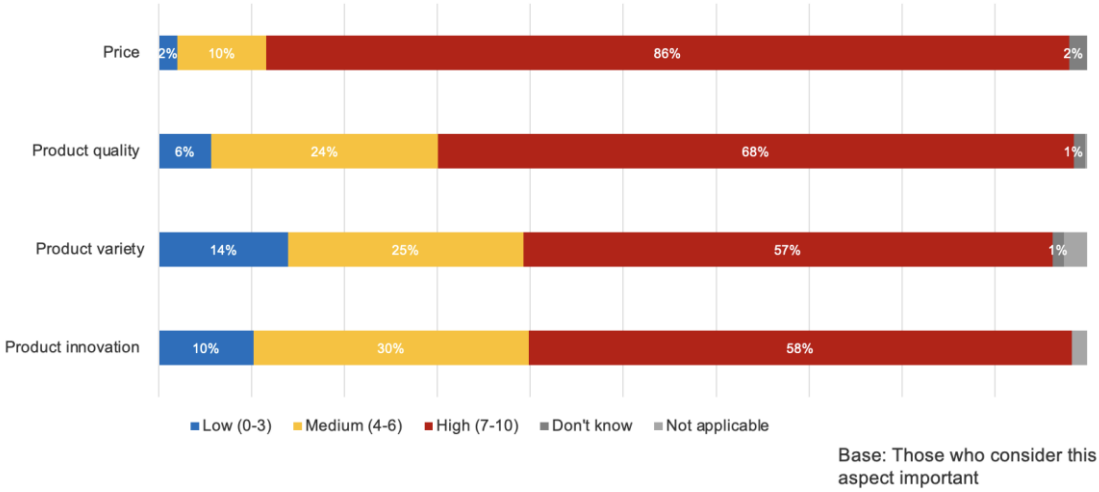
Source: Project Team

Figure D.26: Most mentioned aspects of the product that are important for success in domestic markets



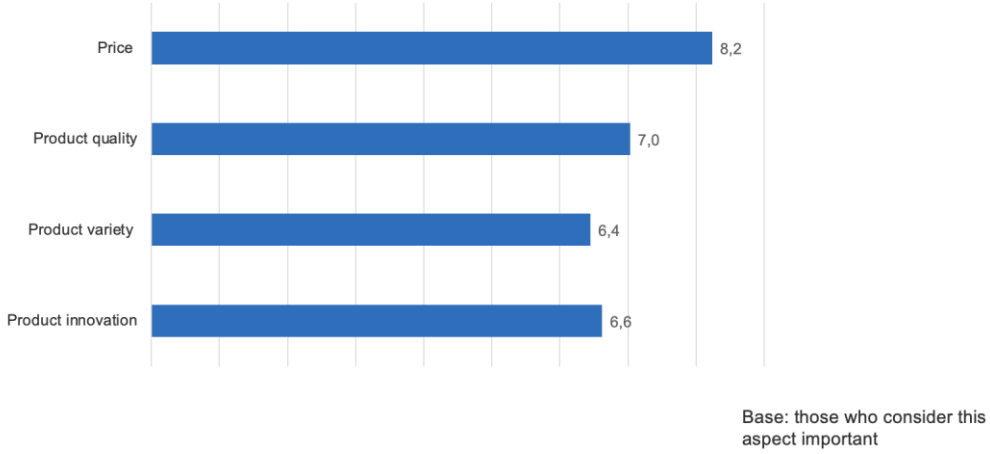
Source: Project Team

Figure D.27: Intensity of competition on different aspects



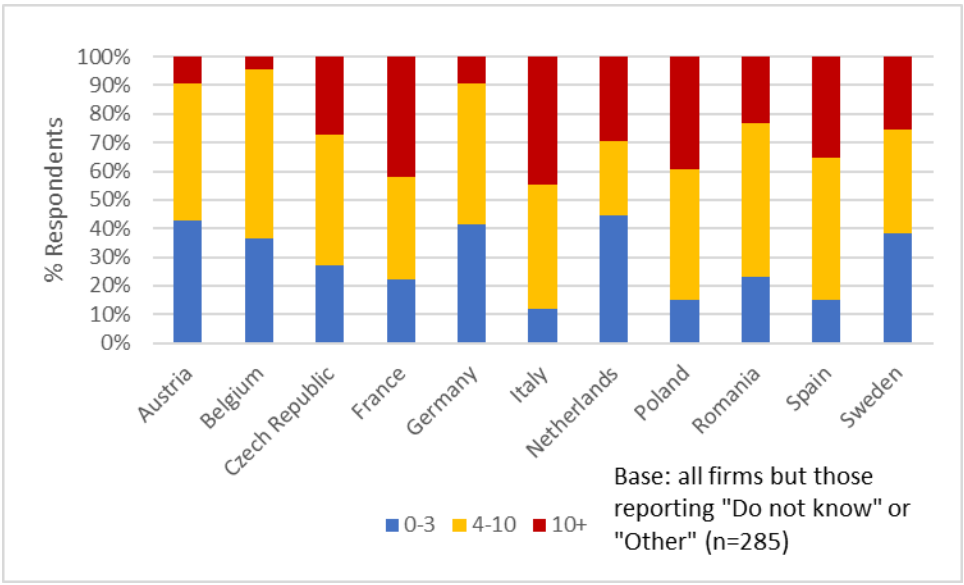
Source: Project Team

Figure D.28: Intensity of competition on different aspects (average on scale 1-10)



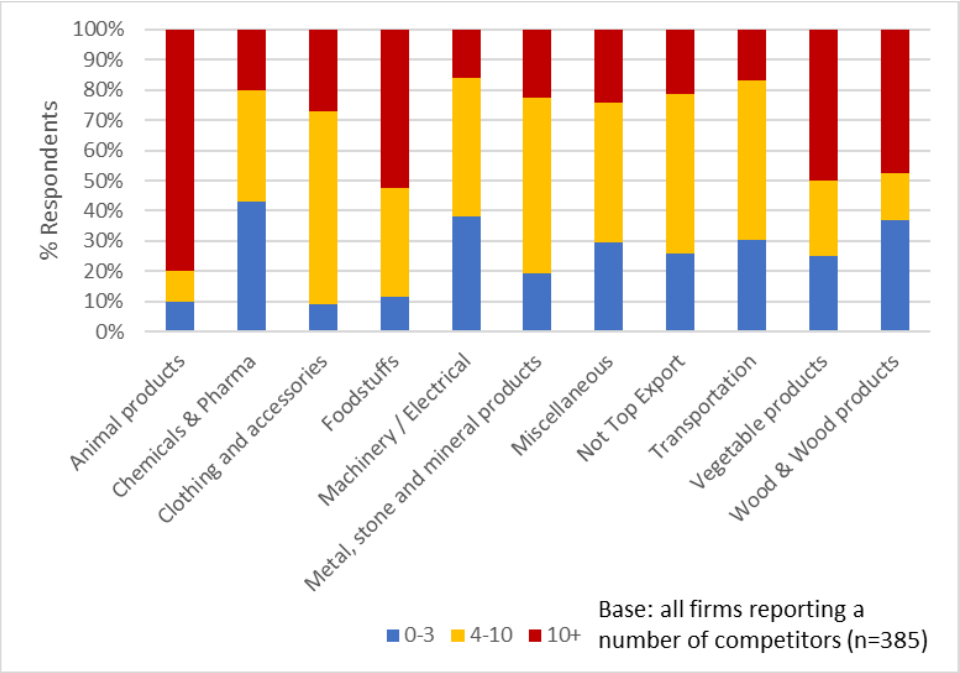
Source: Project Team

Figure D.29: Number of competitors in domestic market by country



Source: Project Team

Figure D.30: Number of competitors in domestic market by sector



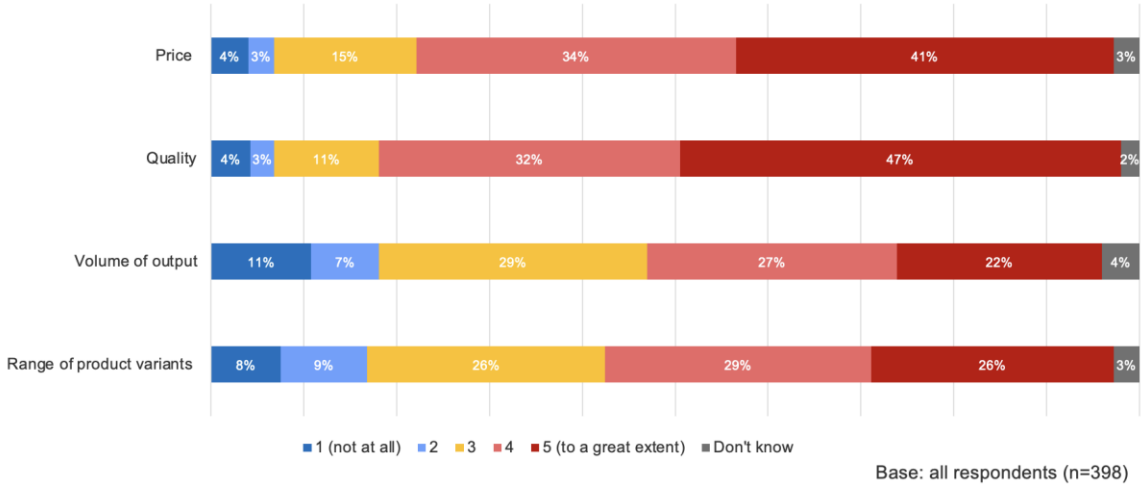
Source: Project Team

Figure D.31: Number of competitors in domestic market by detailed sector

Source: Project Team

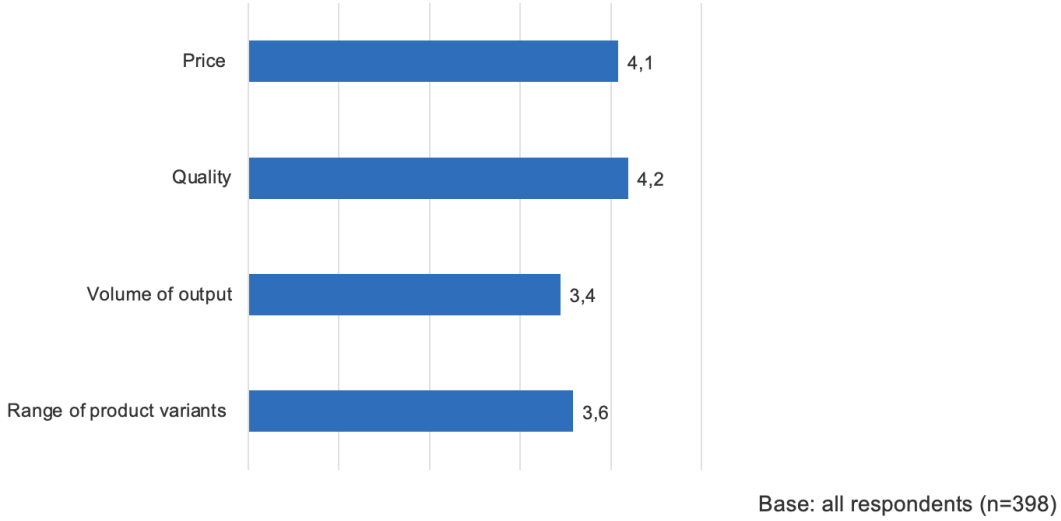
D.6.5 Impact of domestic competition

Figure D.32: Effect of competition in the domestic market on decisions making in company



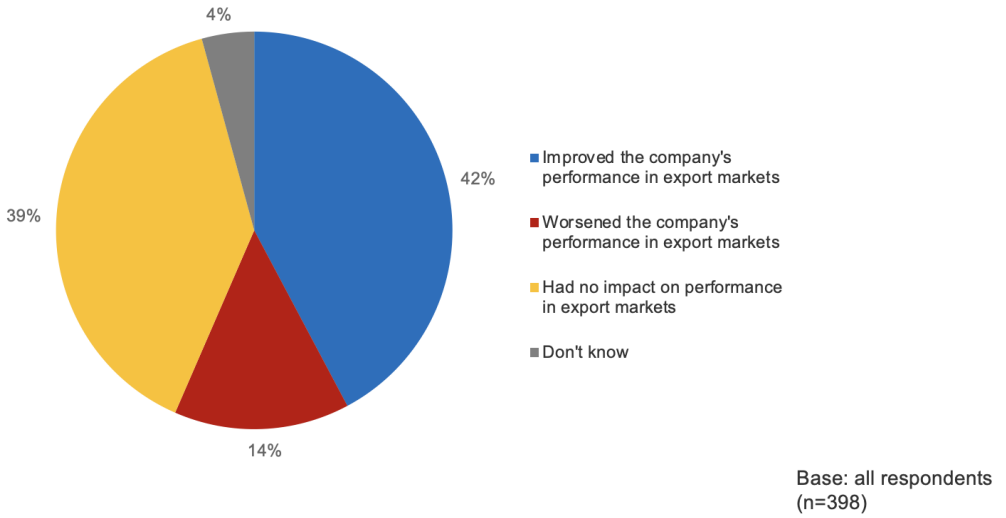
Source: Project Team

Figure D.33: Effect of competition in the domestic market on decisions making in company (averages scores on scale 1-5)



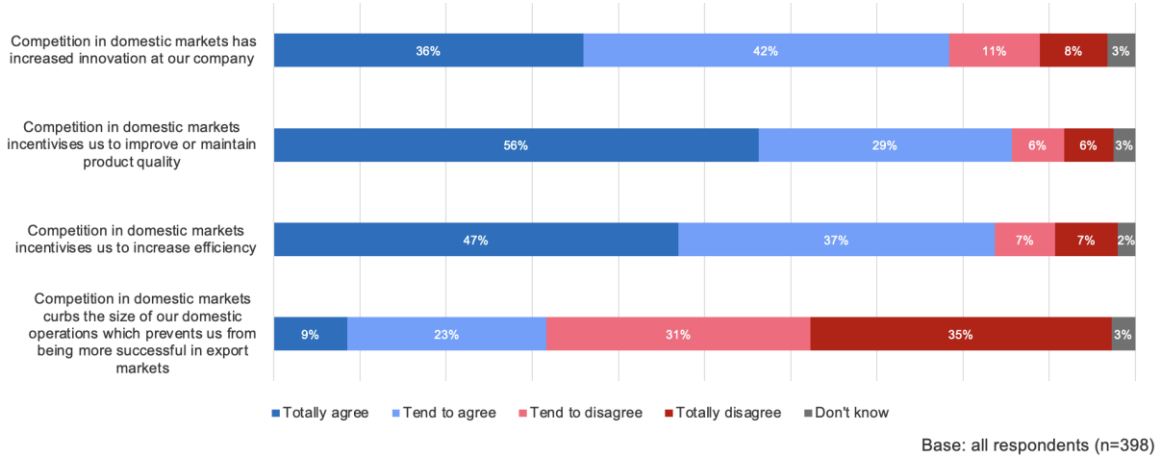
Source: Project Team

Figure D.34: Effect of competitive pressure on performance in export markets



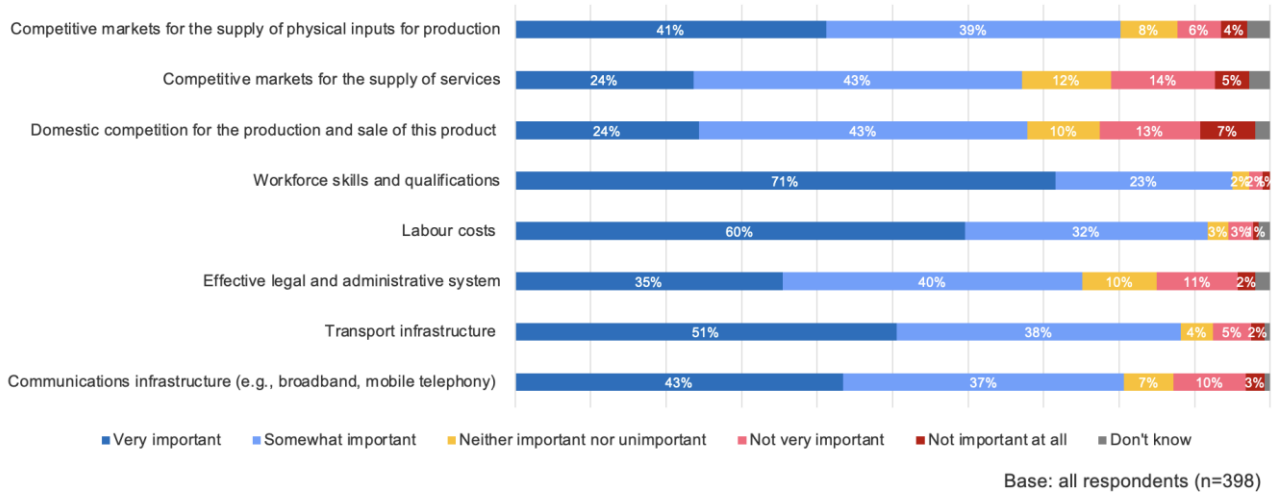
Source: Project Team

Figure D.35: Views on the effect of competition on performance



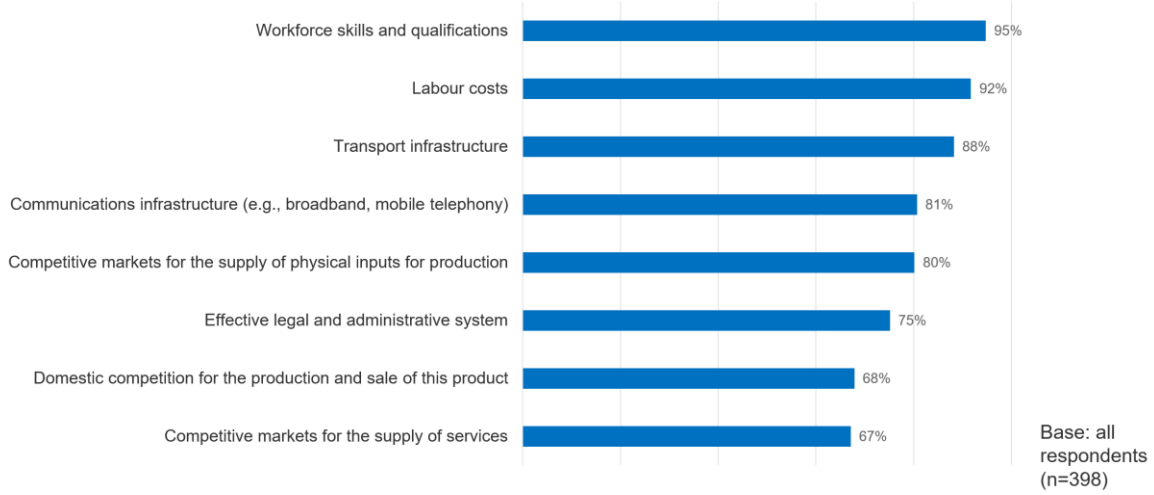
Source: Project Team

Figure D.36: Perceived importance of country factors for company's success in export markets



Source: Project Team

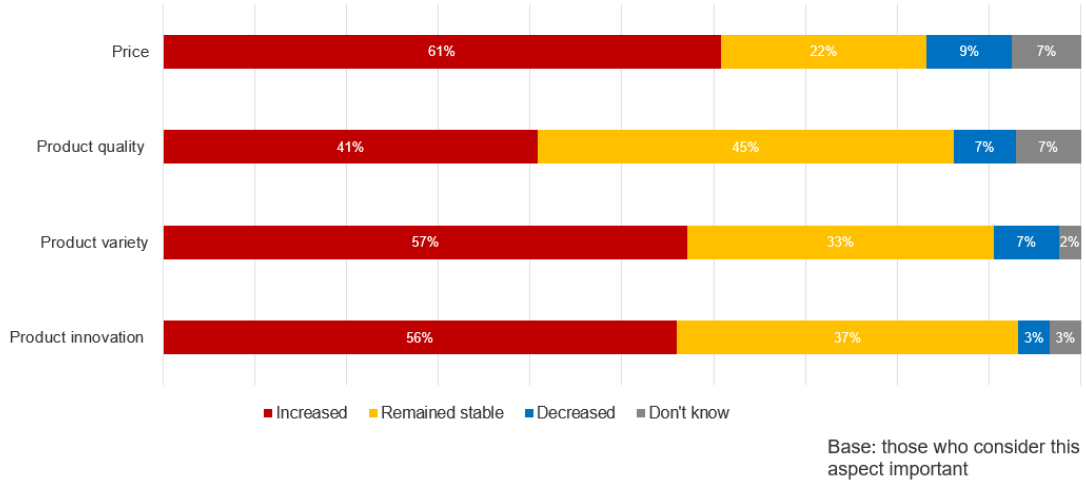
Figure D.37: Perceived importance of country factors for company's success in export markets – total importance



Source: Project Team

D.6.6 Market dynamics

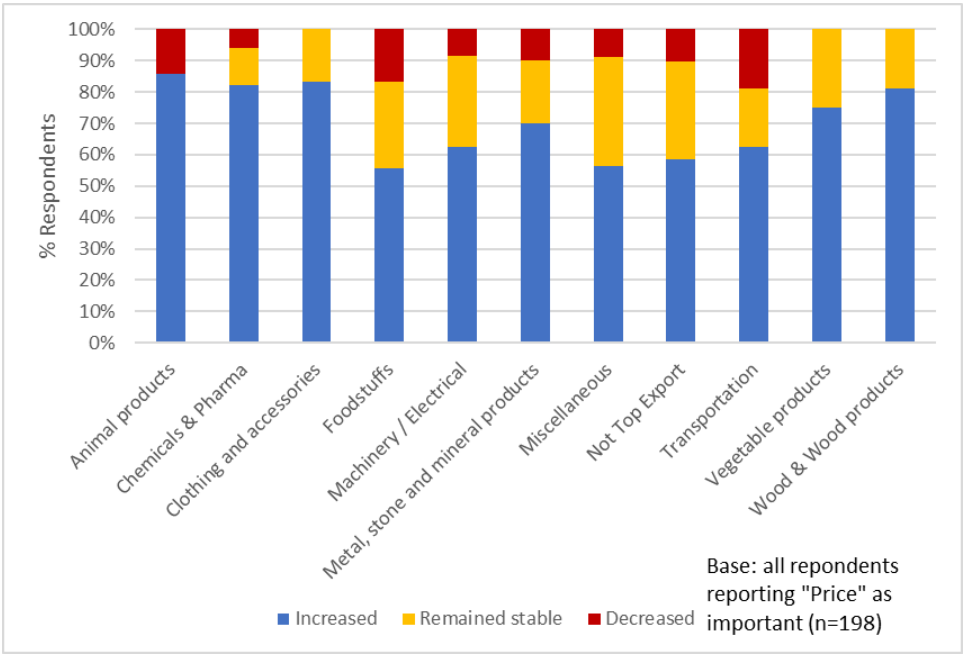
Figure D.38: Change in level of competition on the different aspects among suppliers of goods



Source: Project Team

To further understand the geographical and sectorial distribution of these variations, the Project Team analysed the results dividing the sample of respondents by sector. Overall, all the sectors experienced an increase of price competition in physical inputs, especially Clothing and accessories. The industry affected the least by such increase appears to be Foodstuffs, where less than 60% of respondents report an upward variation in price competition. These cross-sector results are shown in Figure D.39.

Figure D.39: Change in price competition among suppliers, by sector

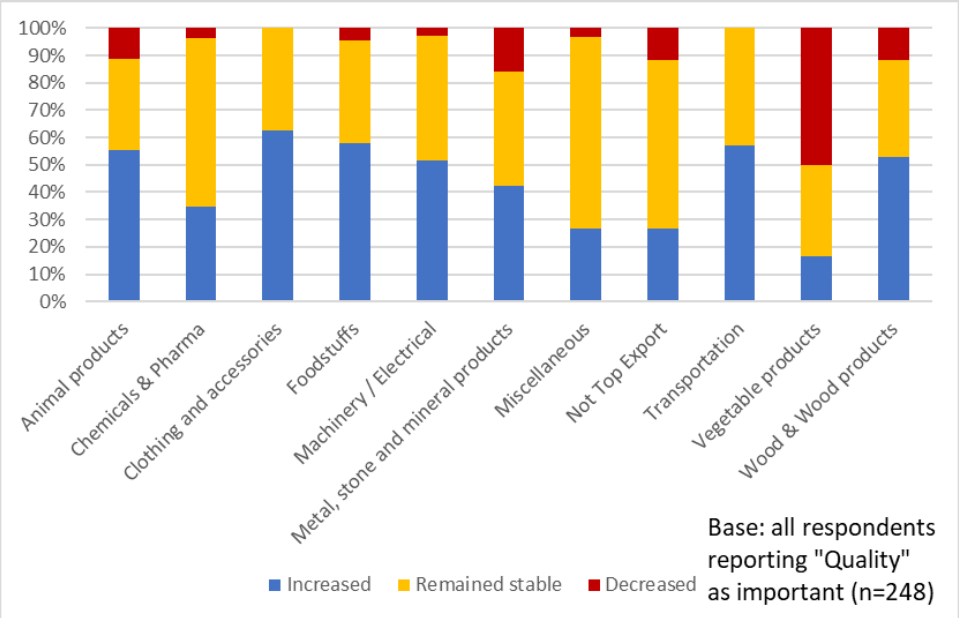


Source: Project Team

The trend of competition on the quality of inputs over the last 10 years represents an exception among the four dimensions analysed, as it is the only one that remained stable for the relative majority of respondents. Regarding sectors, the answers are quite

heterogeneous across them. For example, firms selling Animal products, Clothing and accessories, and Foodstuffs claim that competition on quality has increased over time; companies working in Vegetable products declare instead that it has decreased. The prevalent perception of stability appears to be due to the fact that sectors where this idea prevailed are the most populated ones (i.e., Miscellaneous). These results are shown in Figure D.40.

Figure D.40: Change in quality competition among suppliers, by sector

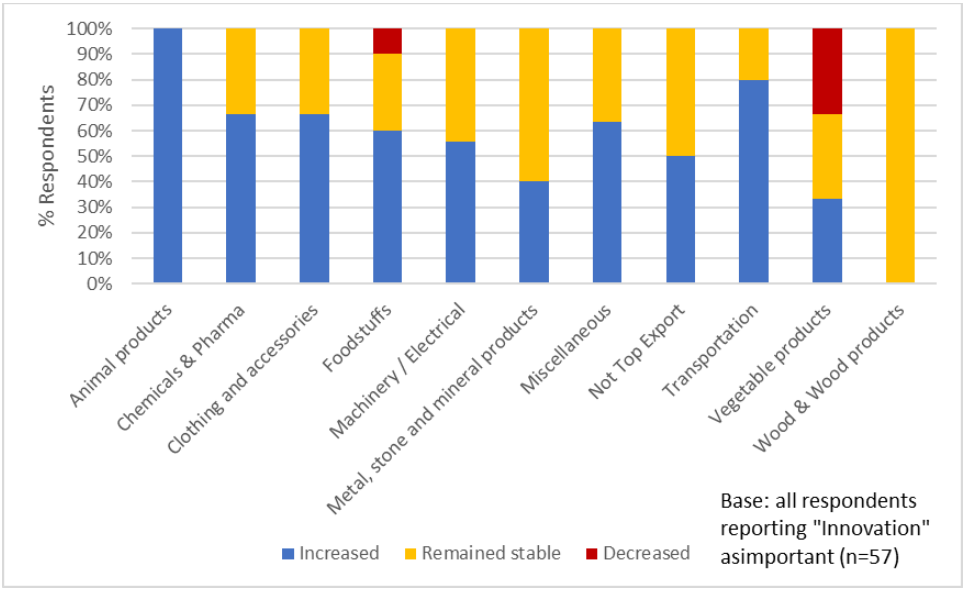


Source: Project Team

Survey results suggest that also competition on product variety among suppliers has increased during the last 10 years. For this feature, however, the base of respondents, i.e., the firms that consider it important, is not statistically sufficient to carry out a more granular analysis without raising robustness concerns on the results.

Lastly, competition on product innovation has experienced an overall increase, but also this result reflects differences across sectors. Animal products, Chemicals and pharmaceuticals, Transportation, Clothing and accessories, Foodstuffs and Machinery/ electrical are the industries where most firms reported that competition on this dimension increased over time. Companies working in Vegetable products instead reported mixed opinions on the matter (see Figure D.41)

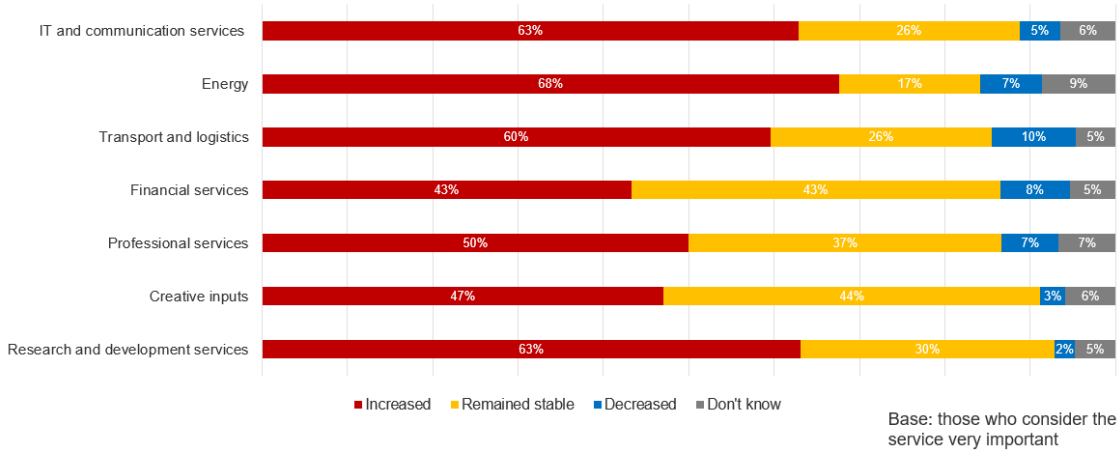
Figure D.41: Change in competition on innovation among suppliers, by sector



Source: Project Team

Similarly to what was done for input markets for goods, results related to input market for services are analysed by sector, and the main cross-sector differences are described below.

Figure D.42: Change in level of competition among suppliers for services



Source: Project Team

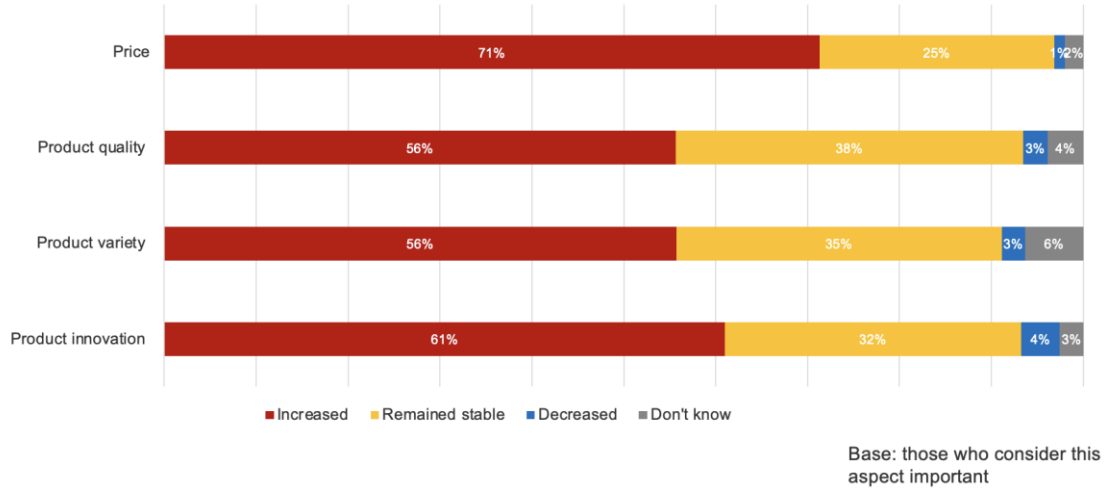
Concerning transports and logistics, the increase in competition was perceived in all sectors but clothing and accessories, where some respondents reported a lower competition, and wood and wood products, where for most of the surveyed firms declared that competition remained stable.

Concerning the change in the level of competition among suppliers of financial services, the aggregate result stems from very heterogeneous opinions across sectors. An interesting fact is that some companies, operating in sectors which generally report that competition got more intense (e.g. Pharmaceuticals), are often located in countries (e.g. France) where the general opinion is that competition has not changed. This suggest

that competition dynamics of the upstream market for financial services are probably industry-driven and not country-specific.

Finally, results concerning R&D services are worth mentioning. This is, together with energy, one of the services that has witnessed the highest increase in competition, with more than 60% of the firms reporting an augmented competition intensity. The survey results are rather homogeneous in this case, with only Animal products and Wood products having a relative majority of firms or more reporting that competition remained stable.

Figure D.43: Change in level of competition in the domestic market on the different aspects



Source: Project Team

D.7 Comparison with findings of other studies

As required in the Technical Specifications, this Annex compares the results of the present study concerning the top export sectors with those of similar studies for the US and Asia (specifically Japan, South Korea and China). In addition to relying on the findings from the literature on these other geographies, the Project Team also identified the top export sectors for the US and the aforementioned Asian countries using the same methodology described in section 4.2.1. This exercise was not required by the Technical Specifications and the Project Team took the initiative to undertake it as it allows to consistently identify the current top export sectors for all those additional geographies. The following subsections describe the findings of our own analysis as well as of the literature in relation to the strongest export sectors in each of the US, Japan, South Korea and China.

D.7.1 The United States

Porter (1990) found that, as of 1985, many of the top US exporting industries were based on natural resources, with 24% of total US exports being natural resource intensive. At the same time as resource-intensive goods made up an important fraction of the US's competitive industries, the US had some strong positions in industries such as defense goods (e.g. war firearms, ammunition, warships), aircraft, computers, air-conditioning equipment and electromedical equipment. The US also had strong positions in forest products (particularly wood products) and in agriculturally related goods. The

US position in agriculture included products (e.g. cotton seed oil[367], soya beans), machinery, specialized inputs (e.g. fertilisers), and services, notably trading. Finally, the US position in health care-related products was also extremely strong and strengthening.

Our analysis shows that currently[368] the top US export sectors comprise a diverse range of industries including machinery and mechanical appliances (vehicles engines, machines for the manufacture of semiconductor devices), agriculture (maize and soya beans), energy (liquified butanes and propane, natural gas), textile (cotton), automotive, healthcare, chemical products and arts (paintings, drawings and artworks created by skilled artists). Interestingly, works of art do not feature as a top export sector in any of the EU countries included in the present study, nor as a top export sector for the EU as a whole.

These results are aligned with those reported by the U.S. Chamber of Commerce (2022)[369], according to which the US leading commodity sectors in 2021 were machinery and mechanical appliances, accounting for 22.5% of the country's exports. Following closely was the category of chemicals, plastics, rubber, and leather products, which comprised 17.3% of the exports, remaining consistent with the figures from 2020. Oils, minerals, lime, and cement constituted the third top commodity sector, representing 14.3% of the country's total exports. The same source also reports that energy production in the US experienced a significant boom in 2021. Notably, crude oil exports reached a remarkable $69.3 billion, surpassing the previous record set in 2019 and becoming the highest export total in any year. Similarly, petroleum exports achieved a record-breaking figure of $196.1 billion in 2021, recovering from a decline caused by the pandemic in 2020.

D.7.2 Japan

Porter (1990) found that the breadth of industries in which Japan had strong positions in 1985 was extremely wide, rivalled only by Germany and the US in his study. Another unique characteristic of the leading Japanese exports in 1985 is the absence of anything approaching a natural resource-intensive industry. The most significant clusters of competitive industries in the Japanese economy were in transportation equipment and related machinery, office machines, entertainment and leisure (notably consumer electronics), steel and fabricated metal products, electronic components and computing equipment, and optical-related products (including cameras and film). Japanese firms also had strong positions in printing equipment, telecommunications equipment (mostly hardware), ceramics-related products, household appliances, electrical goods, and personal mechanical or electronic products (e.g. pens, watches, and clocks).

Japan exhibited little national competitive advantage in forest products, chemicals and plastics, food and beverages, packaged consumer personal products such as detergents or toiletries, and defense-related goods. Japan was also weak internationally in services of nearly all types, as well as health-care and textiles/apparel.

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[367] *Cotton seed oil was the number one US exporting industry in 1985.*

[368] *The analysis was conducted using 2021 data.*

[369] *U.S. Chamber of Commerce. "The Year in Trade: Diving into the 2021 Numbers ". 2022. https://www.uschamber.com/international/trade-agreements/the-year-in-trade-diving-into-the-2021-numbers#:~:text=Financial%20and%20other%20business%20services,of%20the%20U.S.%20services%20sector.*

Currently, the top Japanese export products cover a wide range of industries and reflect the country's technological progress and manufacturing expertise (the latter was already the case in 1985). The New York Times (2021)[370] highlights that in 2021, there has been a significant increase in Japanese exports, primarily driven by the growth in capital goods and the technology sector. One prominent category includes the preparation of chemicals (specifically used in photographic applications), which did not represent a strong exports area back in 1985. In addition, the machinery and equipment industry plays a vital role in Japan's exports (e.g. export of machines and apparatus for flat display and production, machining centers for metalworking processes, self-propelled mechanical shovels, excavators, and shovel loaders). Furthermore, Japan exports various products made from non-cellular plastics (e.g. plates, sheets, film, foil, and strip) as well as precious metals. Finally, Japan also holds strong exports positions in the automotive sector, including vehicles' parts (e.g. gearboxes and parts for tractors and large motor vehicles, motor cars and other vehicles).

Our overall findings are aligned with those of the Statistics Bureau Ministry of Internal Affairs and Communications of Japan (2021)[371] for 2019. According to such source, the largest portion of the total Japanese export value in 2019 was attributed to transport equipment, accounting for 23.6%. General machinery and electrical machinery followed closely, comprising 19.7% and 17.2% of the total export value, respectively. Within the transport equipment category, motor vehicles constituted 15.6% of the total export value. The same source also confirms that a notable characteristic of Japan's exports is the significant proportion of high value-added products manufactured using advanced technology. This includes motor vehicles, iron and steel products, semiconductors, and others.

D.7.3 South Korea

Differently from other countries studied by Porter, such as Japan and Italy, which were relatively advanced before World War II, South Korea emerged as a force in international competition only in the 1970s. Starting in the 1970s, the South Korean industry has rapidly upgraded its competitive advantage, enjoying rapid growth in productivity and per capita income. Yet, at the time of Porter's book, nearly all South Korean industries competed on cost, and Korea had yet to build the demand-side advantages and related and supporting industries necessary to compete on innovation and differentiation.

Compared to the other nations discussed by Porter, in 1985 exports from South Korea were relatively concentrated in a narrow range of industries. By far the most important cluster was in textiles and apparel-related industries, where competitive industries accounted for nearly 30% of total South Korean exports. A second significant cluster was in transportation equipment, including ships and cars. The third and fourth important clusters were, respectively, in consumer electronics products and iron and steel. Other sectors with pockets of strength were in semiconductors (mostly memory chips), food (fish products), cement and international construction services. Korean firms had virtually no position in health care, chemicals and plastics, forest products, most areas of food and consumer packaged goods, and all services except construction.

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[370] *The New York Times. "Japan's Growth Rebounds, but Virus-Related Weakness Looms". 2021. https://www.nytimes.com/2021/02/14/business/japan-gdp-economy-coronavirus.html*

[371] *Statistics Bureau Ministry of Internal Affairs and Communications of Japan. "Statistical Handbook of Japan 2021". 2022. https://www.stat.go.jp/english/data/handbook/pdf/2021all.pdf*

Korea's current leading export products encompass a diverse range of industries, including energy, technology, chemicals, manufacturing, and shipping. At the forefront is the energy and offshore sector (e.g. export of floating or submersible drilling or production platforms and tankers). As in 1985, Korea's leadership in the technology and electronics industry is evident through the export of electronic integrated circuits (e.g. memories and data storage devices). This fact is confirmed by S&P Global (2022)[372], which emphasizes that the electronics manufacturing industry held significant importance within South Korea's manufacturing export sectors in 2021, as the country is a major global exporter of electronic products to crucial markets like the US, China, and the EU. Korea is also dominant in the the chemical and materials industry (e.g. salts of oxometallic or peroxometallic acids and P-Xylene). Other important exported products are display technologies (sheets and plates of polarising material, as well as machines for the manufacture of flat panel displays) and plastics and related products.

In addition, the International Trade Administration (2022b)[373] stresses that South Korea's dominant position in steel and petrochemical sectors have diminished, paving the way for its emergence as a leader in high-tech industries. The same source also highlights that the Korean government has strategically invested on various industries, such as healthcare (including medical devices, pharmaceuticals, and biotechnology), industrial chemicals, information technology (IT) components, semiconductor manufacturing, aero-space and defense, energy, environmental technology, and transportation (including revitalizing the shipbuilding industry).

D.7.4 China

China's top export products also span a large variety of industries. In the transportation sector, China excels in container exports (e.g. providing specialized containers for fluid transportation). UNCTAD (2021)[374] notes that China's impressive export resilience in 2021 has not only facilitated a rapid recovery from the pandemic but has also enabled the country to achieve additional gains in various export sectors, even in cases where those sectors have faced overall decline (e.g. transportation and road vehicles). In particular, the industrial sector in China has showcased this resilience, with shipments from the country's largest exporter increasing by 25.6% in August 2021 compared to the previous year, as reported by Reuters (2021).[375] Additionally, China reached a significant milestone in its auto vehicle exports in 2021, doubling to a record-breaking 2.02 million units, according to the Global Times (2022).[376] Moving to consumer goods, China's exports include Christmas articles (such as decorations and festive accessories). Additionally, China is a significant exporter of toys (including tricycles, scooters, dolls,

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[372] *S&P Global. "South Korean economy boosted by strong exports". 2022. https://www.spglobal.com/marketintelligence/en/mi/research-analysis/south-korean-economy-boosted-by-strong-exports-feb22.html.*

[373] *International Trade Administration. "South Korea - Country Commercial Guide". 2022. https://www.trade.gov/country-commercial-guides/south-korea-market-overview*

[374] *UNCTAD. "GlobaL Trade Update". 2021. https://unctad.org/system/files/official-document/ditcinf2021d1_en.pdf*

[375] *Reuters. "China's economy gets welcome boost from surprisingly strong Aug exports". 2021. https://www.reuters.com/world/china/chinas-aug-export-growth-unexpectedly-picks-up-speed-imports-solidly-up-2021-09-07/*

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[376] *Global Times. "China's auto exports surge in 2021 to reach 2 million units, setting a new record". 2022.https://www.globaltimes.cn/page/202201/1245789.shtml*

and other wheeled toys) meeting the demand for recreational and entertainment products. China's expertise in ceramics is showcased through the export of sanitary fixtures (including sinks, washbasins, and baths). The electronics and technology industry plays a significant role in China's export market (e.g. data-processing machines, including portable devices). China's manufacturing capabilities extend to the production of electric lamps and lighting fittings. Furthermore, video game consoles and machines reflect the country's presence in the gaming industry. The footwear industry is another prominent sector in China's export market, with exports of shoes (made from rubber or plastics). China's top export portfolio also encompasses plastic tableware and kitchenware. Finally, articles and equipment for general physical exercise, gymnastics, and athletics showcase China's presence in the sports and fitness industry.

Annex E The costs of non-competition: annexes

E.1 Data cleaning procedure

In cleaning the Orbis database, the Project Team followed the approach of Diez et al. (2019). The raw dataset includes firms from the EU27 in the 2012-2019 timespan. Both active and inactive firms were considered in the sample.

First, with a preliminary screening of the database, the Project Team filtered out:

- All firms with no recent financial data.
- All public authorities/states/governments.
- All firms with Consolidated balance sheets (to avoid double-counting).

Secondly, to avoid basic reporting mistakes and prevent outliers, firms were retained when they presented:

- Non-negative total assets, sales, and tangible fixed assets in any of the years of the selected period (Diez et al. 2019).
- Non-negative cost of materials, cost of employees, and operating revenues in any of the years of the selected period (Diez et al. 2019).
- Turnover > 1 mln EUR in at least one of the years of the selected period.
- Total assets > 1 mln EUR in at least one of the years of the selected period.
- Tangible fixed assets > 1 mln EUR in at least one of the years considered.

The Project Team then applied further data-cleaning procedures on each balance sheet available in the sample. Each balance sheet had to respect the following criteria:

- Operating revenue > 1 thousand EUR.
- Cost of employees > 1 thousand EUR.
- Material costs > 1 thousand EUR.
- COGS > 1 thousand EUR.
- Tangible-fixed assets > 1 thousand EUR.
- Depreciation and amortization > 1 thousand EUR.

Also, all balance sheets with missing time series on the following variables have been excluded:

- Depreciation and amortization
- Operating revenue
- Sales
- Value-Added
- Cost of employees
- Materials

Finally, the bottom 1% and top 99% of firms regarding labour and materials cost shares on revenues dropped.

The Project Team employed the Eurostat Producer Price Index (PPI) by the NACE sector as a deflator for revenues, material costs, and capital stock. For labour cost, the cost deflator was retrieved by Eurostat.

E.2 Sectoral aggregation

The following table displays the pairing between NACE 2-digit sectors into 39 consolidated sectors, illustrating the specific correspondence of each sector with its aggregated category.

Table E.1: Aggregation of NACE 2-digit sectors

Nace 2-digits	*Nace aggregate*	*Description (Nace 2 digits)*	*Description (Nace aggregate)*
A01	A	Crop and animal production, hunting and related service activities	Agriculture, forestry and fishing
A02	A	Forestry and logging	Agriculture, forestry and fishing
A03	A	Fishing and aquaculture	Agriculture, forestry and fishing
B05	B	Mining of coal and lignite	Mining and quarrying
B06	B	Extraction of crude petroleum and natural gas	Mining and quarrying
B07	B	Mining of metal ores	Mining and quarrying
B08	B	Other mining and quarrying	Mining and quarrying
B09	B	Mining support service activities	Mining and quarrying
C10	C10-12	Manufacture of food products	Manufacture food, beverage and tobacco
C11	C10-12	Manufacture of beverages	Manufacture food, beverage and tobacco
C12	C10-12	Manufacture of tobacco products	Manufacture food, beverage and tobacco
C13	C13-15	Manufacture of textiles	Manufacture of textiles, wearing apparels, leather and related products
C14	C13-15	Manufacture of wearing apparel	Manufacture of textiles, wearing apparels, leather and related products
C15	C13-15	Manufacture of leather and related products	Manufacture of textiles, wearing apparels, leather and related products
C16	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	C17	Manufacture of paper and paper products	Manufacture of paper and paper products
C18	C18	Printing and reproduction of recorded media	Printing and reproduction of recorded media
C19	C19	Manufacture of coke and refined petroleum products	Manufacture of coke and refined petroleum products
C20	C20	Manufacture of chemicals and chemical products	Manufacture of chemicals and chemical products

C21	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	C22	Manufacture of rubber and plastic products	Manufacture of rubber and plastic products
C23	C23	Manufacture of other non-metallic mineral products	Manufacture of other non-metallic mineral products
C24	C24	Manufacture of basic metals	Manufacture of basic metals
C25	C25	Manufacture of fabricated metal products, except machinery and equipment	Manufacture of fabricated metal products, except machinery and equipment
C26	C26	Manufacture of computer, electronic and optical products	Manufacture of computer, electronic and optical products
C27	C27	Manufacture of electrical equipment	Manufacture of electrical equipment
C28	C28	Manufacture of machinery and equipment n.e.c.	Manufacture of machinery and equipment n.e.c.
C29	C29	Manufacture of motor vehicles, trailers and semi-trailers	Manufacture of motor vehicles, trailers and semi-trailers
C30	C30	Manufacture of other transport equipment	Manufacture of other transport equipment
C31	C31_32	Manufacture of furniture	Manufacture of furniture and other manufacturing
C32	C31_32	Other manufacturing	Manufacture of furniture and other manufacturing
C33	C33	Repair and installation of machinery and equipment	Repair and installation of machinery and equipment
D35	D	Electricity, gas, steam and air conditioning supply	Electricity, gas, steam and air 473ondition supply
E36	E36	Water collection, treatment and supply	Water collection, treatment and supply
E37	E37-39	Sewerage	Sewerage, waste collection, treatment and disposal activities; materials recovery, remediation activities and other waste management services
E38	E37-39	Waste collection, treatment and disposal activities; materials recovery	Sewerage, waste collection, treatment and disposal activities; materials recovery, remediation activities and other waste management services
E39	E37-39	Remediation activities and other waste management services	Sewerage, waste collection, treatment and disposal activities; materials recovery, remediation activities and other waste management services
F41	F	Construction of buildings	Construction
F42	F	Civil engineering	Construction
F43	F	Specialised construction activities	Construction

G45	G45	Wholesale and retail trade and repair of motor vehicles and motorcycles	Wholesale and retail trade and repair of motor vehicles and motorcycles
G46	G46	Wholesale trade, except of motor vehicles and motorcycles	Wholesale trade, except of motor vehicles and motorcycles
G47	G47	Retail trade, except of motor vehicles and motorcycles	Retail trade, except of motor vehicles and motorcycles
H49	H	Land transport and transport via pipelines	Transportation and storage
H50	H	Water transport	Transportation and storage
H51	H	Air transport	Transportation and storage
H52	H	Warehousing and support activities for transportation	Transportation and storage
H53	H	Postal and courier activities	Transportation and storage
I55	I	Accommodation	Accomodation and food service activities
I56	I	Food and beverage service activities	Accomodation and food service activities
J58	J	Publishing activities	Information and communication
J59	J	Motion picture, video and television programme production, sound recording and music publishing activities	Information and communication
J60	J	Programming and broadcasting activities	Information and communication
J61	J	Telecommunications	Information and communication
J62	J	Computer programming, consultancy and related activities	Information and communication
J63	J	Information service activities	Information and communication
K64	K	Financial service activities, except insurance and pension funding	Financial and insurance activities
K65	K	Insurance, reinsurance and pension funding, except compulsory social security	Financial and insurance activities
K66	K	Activities auxiliary to financial services and insurance activities	Financial and insurance activities
L68	L68	Real estate activities	Real estate activities
M69	M	Legal and accounting activities	Professional, scientific and technical activities
M70	M	Activities of head offices; management consultancy activities	Professional, scientific and technical activities
M71	M	Architectural and engineering activities; technical testing and analysis	Professional, scientific and technical activities

M72	M	Scientific research and development	Professional, scientific and technical activities
M73	M	Advertising and market research	Professional, scientific and technical activities
M74	M	Other professional, scientific and technical activities	Professional, scientific and technical activities
M75	M	Veterinary activities	Professional, scientific and technical activities
N77	N	Rental and leasing activities	Administrative and support service activities
N78	N	Employment activities	Administrative and support service activities
N79	N	Travel agency, tour operator reservation service and related activities	Administrative and support service activities
N80	N	Security and investigation activities	Administrative and support service activities
N81	N	Services to buildings and landscape activities	Administrative and support service activities
N82	N	Office administrative, office support and other business support activities	Administrative and support service activities
O84	O_P	Public administration and defence; compulsory social security	Public administration and defence; compulsory social security, education
P85	O_P	Education	Public administration and defence; compulsory social security, education
Q86	Q	Human health activities	Human health and social work activities
Q87	Q	Residential care activities	Human health and social work activities
Q88	Q	Social work activities without accommodation	Human health and social work activities
R90	R	Creative, arts and entertainment activities	Arts, entertainment and recreation
R91	R	Libraries, archives, museums and other cultural activities	Arts, entertainment and recreation
R92	R	Gambling and betting activities	Arts, entertainment and recreation
R93	R	Sports activities and amusement and recreation activities	Arts, entertainment and recreation
S94	S	Activities of membership organisations	Other service activities
S95	S	Repair of computers and personal and household goods	Other service activities
S96	S	Other personal service activities	Other service activities
T97	T	Activities of households as employers of domestic personnel	Activities of households as employers; undifferentiated goods- and services-

			producing activities of households for own use
T98	T	Undifferentiated goods- and services-producing activities of private households for own use	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
U99	U	Activities of extraterritorial organisations and bodies	Activities of extraterritorial organisations and bodies

Source: Eurostat

E.3 Markup estimation

This section is devoted to the technical illustrations of the markup estimation procedure followed in this study.

Elaborating on the De Loecker and Warzynski (2012) framework, markup of firm I at time t is expressed as the ratio of output elasticity to a given flexible input v and the revenue share of that input v, denoted α^v:

$$\mu_{it} = \frac{\beta_v}{\alpha_{it}^v} \quad (1)$$

In economic terms, the equation describes the extent to which firms are pricing their products above marginal costs. In the context of perfect competition, the output elasticity, should ideally equal the input revenue share, which would lead to a markup of 1, implying that prices equal marginal costs. Thus, no additional profits are extracted by firms. When the ratio exceeds 1 (i.e., >1), it is indicative of firms having the ability to price their products at a level that exceeds their marginal costs, thereby capturing additional profits.

The regression of the firm-level production function, estimated separately for each sector,[377] is as in Diez et al. (2018):

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_v \boldsymbol{v}_{it} + \omega_{it} + \epsilon_{it} \quad (2)$$

where y_{it} is the natural logarithm of the fir''s real output at time t, k_{it} denotes the natural logarithm of the fir"s capital stock (estimated at the firm-level using the standard Perpetual Inventory Method[378]), $\boldsymbol{v}_{it}$ symbolizes a vector of flexible inputs (or free variables) in logarithmic form, ω_{it} is the unobservable productivity term, modelled as a function of k_{it} and v_{it} (assumed to follow a first-order Markov process[379]), and ϵ_{it} represents the idiosyncratic error term.

[377] *The 39 NACE sectors used are detailed in the Annex B.2.*

[378] *The standard Perpetual Inventory Method uses the book value of fixed tangible assets and depreciation to define the level of capital stock K_{it} of firm i in year t as $K_{it} = K_{i,t-1}(1 - \delta_{it}) + I_{it}$, where real investments I_{it} are calculated as the difference between the current and lagged book value of fixed tangible assets plus depreciation, deflated by country and industry specific investment deflators. For further details see Gal (2013).*

[379] *Productivity is generally assumed to follow a first order Markov process, i.e., a process in which the future realization of a variable does not depend on its past values but only on its present. Following the nomenclature used in Diez et al. (2018): $\omega_{it} = g_t(\omega_{it-1}) + \xi_{it}$ where ξ_{it} are the innovation shocks to productivity.*

Two different model specifications for equation (2) were estimated. First, a model where both materials and labour are included in (2), but only the coefficient attached to materials is considered in the markup estimation, as it represents the only fully flexible input and better proxies the economic concept of elasticity. The second version incorporates COGS as the flexible input v_{it}, encompassing both labour and materials together as fully adaptable inputs. The depended variable selected is gross output.

The methodology behind these estimations is rooted in the Levinsohn and Petrin (2003) approach. Depending on the version of the model, different dependent variables were utilized: the first relies on the firm's real value added, while the second is based on real output. Consistent with Calligaris et al. (2022), all versions of the model integrate year and country fixed effects.

Post-estimation, using the framework outlined in equation (1), firm-level markups were calculated, and firm-level values of log-productivity obtained as residuals.

To confirm the positive link between profitability and markups, the Project Team investigates the statistical relationship between the two in the estimation sample. The results reported in Table E.2 are positive as expected.

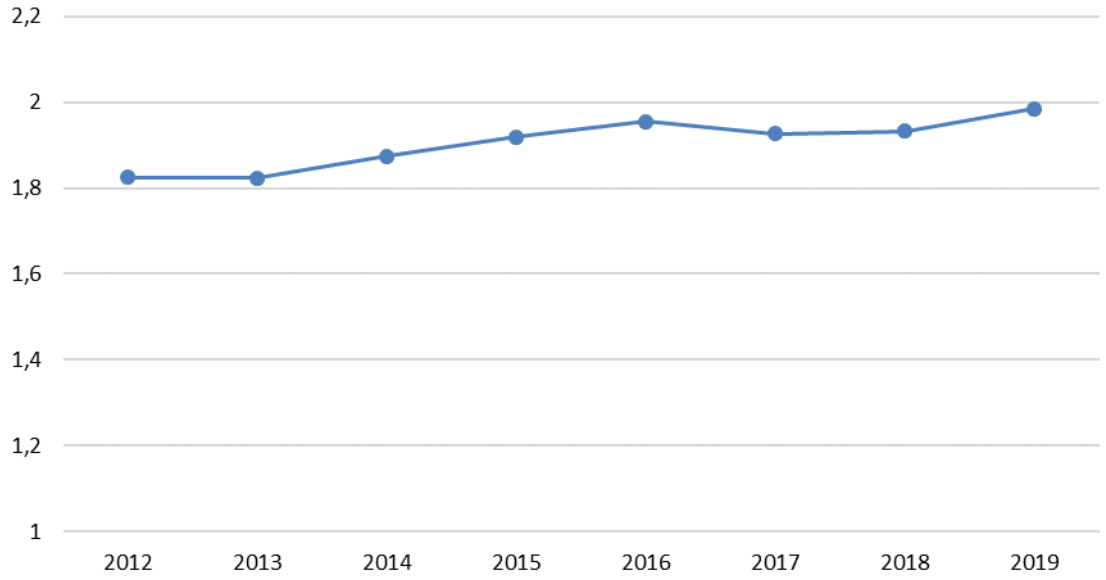
Table E.2: Estimation of relationship between markup and profitability at firm-level

	(1) *Markup*	*(2)* *Log Markup*	*(3)* *Log Markup*
EBITDA margin	0.0019*** (0.0003)		0.0010** (0.0002)
Log EBITDA margin		0.0148*** (0.0020)	
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	716,208	716,208	716,208

*Note: Markups are obtained using materials as the flexible input. **p<0.01, *p<0.05. Dependent variable: log firm productivity. Standard errors clustered by country and industry in parentheses. Source: Project Team based on ORBIS data*

E.4 Alternative markup estimates

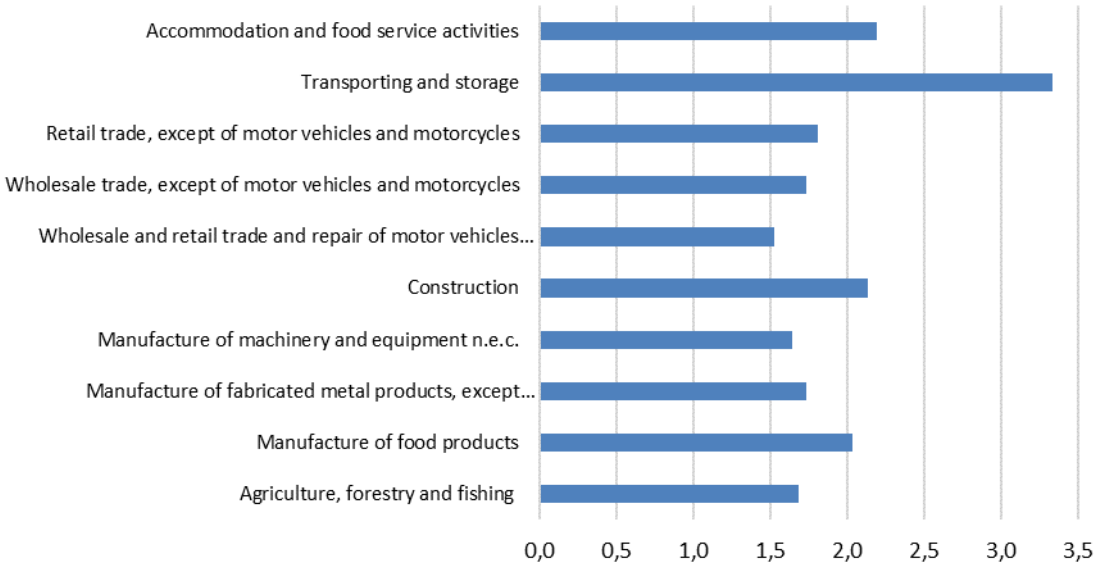
Figure E.1: EU turnover weighted markup evolution – COGS[380] as fully flexible input



Source: Project Team based on ORBIS and Eurostat data

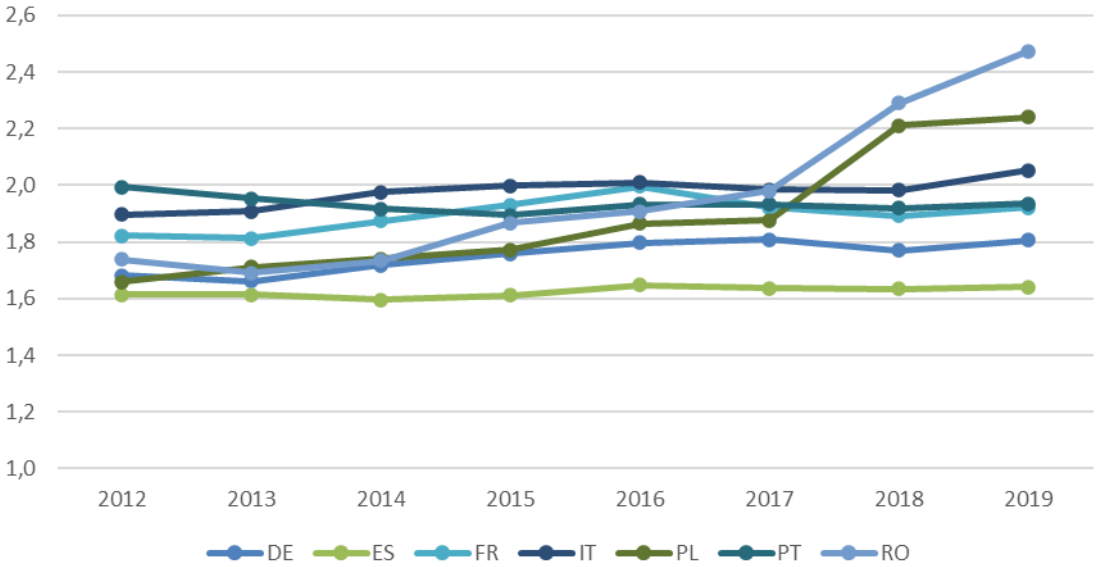
[380] *The variable COGS is constructed from the Project Team as the sum of labour cost and cost of materials from ORBIS.*

Figure E.2: Turnover weighted sectoral markup distribution – COGS as fully flexible input



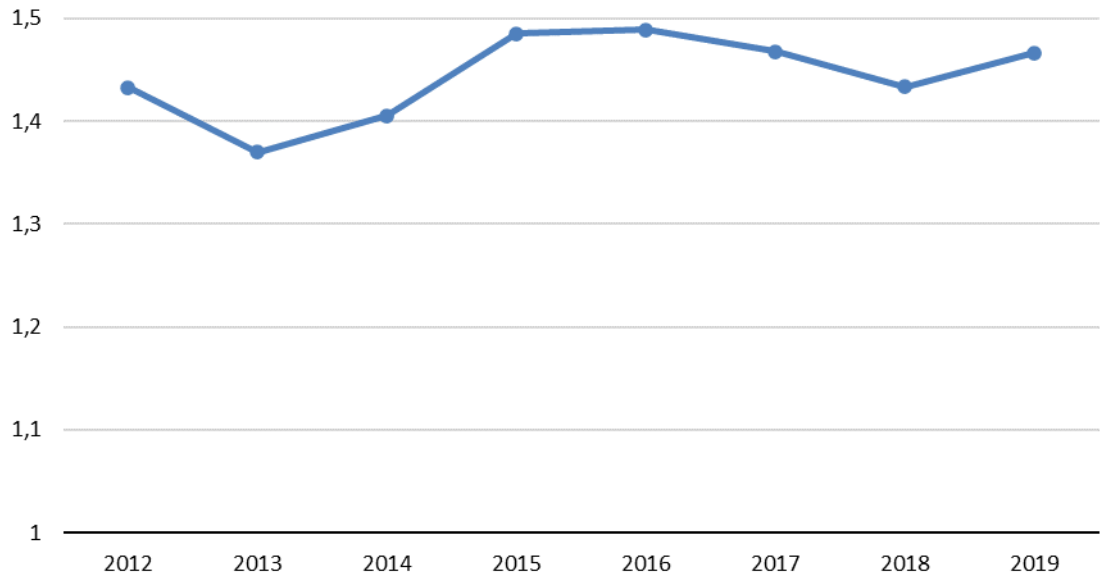
Note: Correlation between sectoral ranking of COGS-markups and Materials-markups is 0.6. Correlation between sectoral COGS-markups and Materials-markups is 0.4. Source: Project Team based on ORBIS and Eurostat data

Figure E.3: Turnover weighted country markup evolution – COGS as fully flexible input



Note: Correlation between country ranking of COGS-markups and Materials-markups is 0.8. Correlation between country COGS-markups and Materials-markups is 0.8. Source: The Project Team based on ORBIS and Eurostat data

Figure E.4: EU turnover weighted markup evolution – Materials as fully flexible input – only firms with GUOs in the same country



Note: correlation between whole sample material markups and GUO sample material markups is 0.997.

Source: The Project Team based on ORBIS and Eurostat data

E.5 Markup impact on firm level productivity

The formal representation of our baseline estimation technique, in line with Rodríguez-Castelán et al. (2020), can be reported as:

$$\widehat{TFP}_{i,t} = \alpha + \beta C_{c,s,t} + \Theta_{c,s,t} + \epsilon_{i,t} \quad (3)$$

where $\widehat{TFP}_{i,t}$ is the log-productivity level of firm *i* in year *t* estimated from equation (2); $C_{r,s,t}$ is the competition level indicator in country *c* and sector *s* where firm *i* operates, and Θ is a set of fixed effects combining the *c*, *s*, and *t* dimensions in various possible ways (e.g. *c*, *s*, *t*, or *cs*, *st*). The variable C is constructed as the log of the markup estimated in equation (1), aggregated within country *c*, NACE sector *s* and year *t* using firm-level turnover as weights. The coefficient β therefore measures the elasticity of firm-level productivity to sector-level markups.

Table E.3: Estimation of elasticity of firm TFP to sectoral markups

	(1) ***Materials markup***		***(2)*** ***COGS markup***	
Log markup (c, s, t)	-0.1262* (0.0507)	-0.1277 ** (0.0177)	-0.0626 (0.0634)	-0.1210*** (0.0259)
Country FE	Yes	No	Yes	No
Sector FE	Yes	No	Yes	No
Year FE	Yes	No	Yes	No

Country-year FE	No	Yes	No	Yes
Sector-year FE	No	Yes	No	Yes
Observations SE	901,832		799,528	

Notes: $**p<0.01, *p<0.05$. Dependent variable: log firm productivity. Standard errors clustered by country and industry in parentheses. Source: Project Team based on ORBIS data

E.6 MATER details and simulations

E.6.1 Structure of the MATER model

As mentioned in section 5.3.1, the MATER model is composed by two integrated building blocks: an OLG model and a DSGE model. The large-scale OLG layer is a non-linear, multi-country model that evaluates potential Gross Domestic Product (GDP) and determines natural rates based on demographic, technological, and globalization factors. This model is used to provide an understanding of the long-term economic trends and the impact of various structural changes, and it is based on Catalano (2023). The OLG model is designed to solve for very long run time periods (more than 300 years). In this model, cohorts set optimally their saving, consumption, and labour supply with either perfect or myopic foresight. Firms, on the other hand, set optimally their investments and demand for saving. Financial markets allocate international savings among different regions.

On the other hand, the DSGE layer is a standard New Keynesian model that features detrended variables using potential GDP and other macroeconomic levels from the OLG model. This model is used to analyse the short-term economic fluctuations and the effects of monetary and fiscal policies. The DSGE model takes some inputs from the OLG model, where agents under the rational expectation hypothesis are informed about potential growth, natural rates, and equilibrium inflation. This set of information conditions agents' expectations towards the future in an optimistic or pessimistic way.

The DSGE model features an open economy, representing the EU27 under the adopted calibration. This region-specific DSGE model is estimated choosing observable variables and parameters to be fitted through standard Bayesian method with data at the EU27 level. The calibration follows the most recent standard of the literature to generate empirically plausible estimations, and to fit notable features of the macroeconomic time series. The DSGE model is solved by simulating it in a global-DSGE setting.

Both domestic and international financial markets, including the banking sector, set interest rates on various markets, such as bonds, firms, and households' capital. The external sector includes all foreign agents that interact with the domestic economy, such as the monetary authority, i.e., the European Central Bank, which sets the monetary policy interest rate, thus monitoring the inflation gap in the euro area. Finally, the government issues debt (financed by financial markets), demands final goods and accumulates productive investment.

The final macroeconomic variable is the sum of both long-run equilibria and short-run dynamics. This principle holds for macroeconomic aggregates, such as GDP, consumption, investments, and price dynamics, as well as for interest rates and financial assets like public debt and households' wealth. The DSGE model is estimated including a set of observables (GDP, consumptions, investment, unemployment, net export, public spending, potential growth, effective exchange rates, natural interest rate). The

baseline calibration of the model replicates the status quo of competition and economic conditions at the EU27 aggregate level. This represents the initial steady state of the model simulations. Given the model framework, final prices can be expressed as follows:[381]

$$Prices = \frac{Markup}{TFP} Marginal\ Cost \quad \textbf{(4)}$$

From equation (4), it's evident that a direct proportionality exists between final prices and both the Markup and Marginal Cost. This implies that an increase in either the Markup or Marginal Cost, ceteris paribus, will result in an upward shift in prices. Furthermore, an inverse relationship exists between prices and TFP, meaning that an enhancement in TFP will, ceteris paribus, exert downward pressure on the price level. In the context of the MATER model, heightened competition, manifested as a reduced Markup, correlates with a decrease in the final prices. Concurrently, an uptick in TFP, holding other factors constant, also precipitates a decline in prices.

E.6.2 Channels in the MATER model

Aggregate demand is sustained by disposable income originating from positive expected labour and capital incomes.

More in detail, the income effect arises from the increased households' real labour and capital income, which leads to a positive variation in disposable income. This, in turn, boosts consumption and investment expenditure. The reduction in the final price caused by the shock augments final demand, defined as the ratio of nominal disposable income and price, expanding the size of the market, which is the volume of traded goods per unit of time. Hence, an increase in households' real disposable income, composed of real labour and capital incomes, allows different agents to increase the demand for goods. Labour income is the result of the individual real wage rate (intensive margin) over the units of employed persons (extensive margin) and capital income results from the real capital return multiplied by financial and real asset holdings. The expansion of labour disposable income is therefore the result of an increase in employment and of an increase in the real wage.

Anticipating higher real interest rates leads to higher current consumption, but the effects depend on the financial conditions of the agents.

At the same time, deflationary pressure triggered by the markup reduction leads to an increase in labour and investments demand, leading to higher real wages and interest rates, with the former having a mixed effect depending on the agent considered. Indeed, the MATER model includes different types of households: savers, and borrowers. Savers have no credit constraint and can smooth their consumption over time as they prefer, whereas borrowers are credit constrained and cannot adjust their consumption as desired. In the short run, however, agents anticipate higher interest rates, which triggers a substitution effect. For example, if agents are net borrowers, the financing

[381] *To determine the prices charged for final goods by retailers, it is first necessary to obtain the prices charged by the wholesale sector, which operates under a perfectly competitive market structure. Wholesalers maximize their profits by optimally choosing the production inputs (capital and labour), give a certain production technology, which also includes a measure of TFP. The results of the wholesaler problem correspond to a match between marginal product of inputs and their marginal costs, scaled by the efficiency of the production process (TFP). These are the prices faced by the retailers, who operate in monopolistic competition and charge a markup to the original prices of perfect competition.*

cost of future consumption increases, leading to a reduction in consumption and borrowing. On the other hand, given the increase in interest rates caused by the markup shock, savers tend to increase their savings. Hence, savers benefit from the increase in financial disposable income via a growth in real interest rates, while the borrowers benefit only from the increase in wages and the slight increase in employment. Another type of agents present in the MATER model is represented by entrepreneurs, who are the firms' owners and hence are affected by changes in firms' profits. With a reduction of markup, firms' profits decrease, inducing a negative income effect on entrepreneurs.

Positive expansionary effects are slightly limited by expected asset holdings change.

Another effect that is at play only for the savers is the devaluation of the net present value for capital value represented by real and financial assets. Indeed, a growing real interest rate, due to the decrease in prices, represents an expected reduction in the net present value of real valued asset holdings, a negative wealth effect. Savers are partially hit by this effect and therefore limit their increase in investment. Overall, at the aggregate level this channel translates into a lower increase in investments compared to consumption. The wealth effect is driven by the anticipated reduction in markups, which creates both positive (higher expected real labour income) and negative (lower present value of labour income) effects.

The amplification effect of the TFP shock.

Following the empirical and theoretical literature (see Syverson, 2011 and Aghion et al., 2005; 2009), the analysis considers the case in which an increase in competition has a positive effect also on the level of TFP. The impact of the TFP shock is to reduce the marginal cost of production and consequently also the final prices charged by firms, who are facing at the same time less market power. The deflationary effect of the increased productivity reinforces the markup effects, amplifying the transmission channels discussed above.

E.7 Simulations' results

This section presents the additional results of the macroeconomic simulations relative to scenario 2 and 3 presented in the main text and an additional scenario (Scenario 4) for Approach 1 (literature-based). The additional scenario consists of a future version of Scenario 1 (see section 3.1.1). From the information on the literature-base EU markup percentage change increase (7.54%) and on the current EU level of markup (1.157), the initial level of markup is set equal to 1.08, with a phase-in period of 5 years. In this scenario, the increase in market power is "undone", by reducing the current markup to this initial level. This implies a reduction of -7.01% in the current markup. In this future scenario of Approach 1, the considered base year in which the markup shock takes place from year 2022. The resulting impacts are interpreted as benefits of competition, as they seek to answer the question "What would happen if competition were to increase, reverting to an initial level featuring more competition than today?".

This section also presents the results for scenarios 2, 3 and 4 in their version with a one-year lagged TFP shock that sums to the original markup shock.

Table E.4: Future scenario, -7.01% change in markup, from 2022 (with 5-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.33	1.65	3.35	5.37	6.13
GDP deflator	-0.59	-2.51	-4.14	-4.86	-4.97
Consumption	0.44	1.70	3.56	5.26	5.85
Investments	-0.02	1.72	1.41	1.02	1.56
Employment	0.31	1.29	2.69	4.42	4.91
Profits	-0.72	-5.14	-9.56	-15.07	-21.31
Labour Productivity	0.05	0.37	0.71	0.97	1.24
Export	0.31	1.48	3.11	4.80	5.48
Import	-0.06	-0.01	-0.42	-1.07	-1.24

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.5: Future Scenario, -7.01% change in markup & 0.91% TFP increase, from 2022 (with 5-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.33	1.91	4.53	7.33	9.00
GDP deflator	-0.58	-2.36	-3.56	-4.02	-4.02
Consumption	0.43	1.84	4.35	6.84	8.28
Investments	-0.02	3.12	3.91	3.73	4.34
Employment	0.32	1.40	2.77	4.14	4.56
Profits	-0.71	-5.13	-9.47	-15.07	-21.39
Labour Productivity	0.05	0.57	1.89	3.18	7.26
Export	0.32	1.68	3.14	5.96	8.23
Import	-0.06	0.25	-0.18	-1.00	-1.45

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.6: Scenario Trimming, -8,45% change in markup & 1.10% TFP increase, from 2022 (with 5-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.40	2.28	5.35	8.66	10.60
GDP deflator	-0.81	-2.86	-4.31	-4.91	-4.92
Consumption	0.47	2.20	5.20	8.11	9.77
Investments	-0.03	3.64	4.52	4.27	5.00
Employment	0.38	1.68	3.24	5.01	5.52
Profits	-0.84	-6.18	-11.12	-18.14	-25.75
Labour Productivity	0.06	0.67	2.20	3.65	8.25
Export	0.37	2.01	3.91	7.08	9.68
Import	-0.07	0.28	-0.23	-1.21	-1.73

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

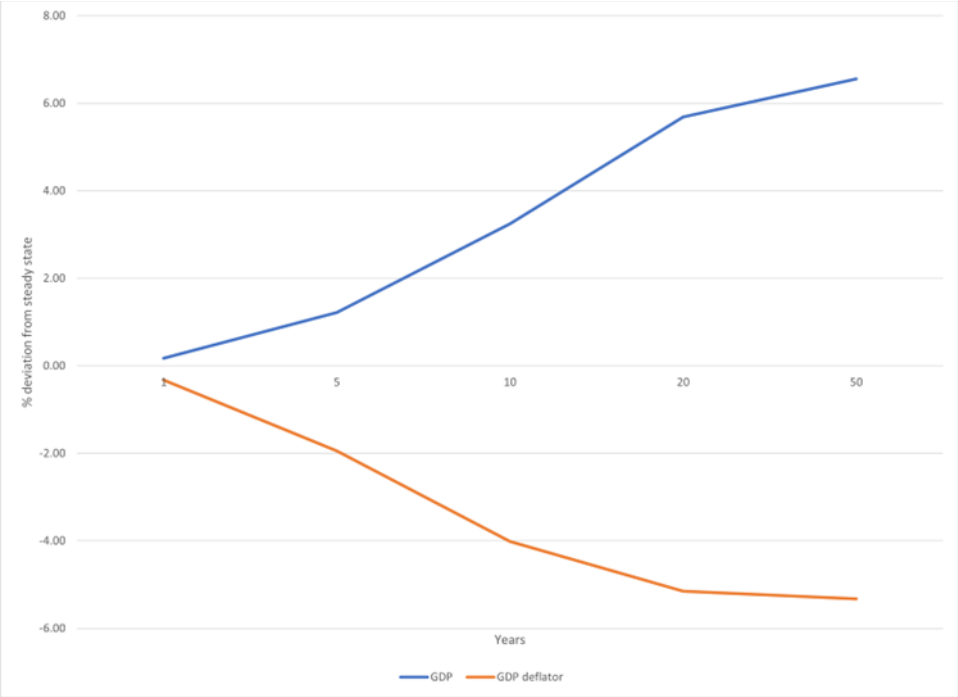
Table E.7: Scenario Convergence, -8,38% change in markup & 1.09% TFP increase, from 2022 (with 5-Y phase-in)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.39	2.21	5.21	8.44	10.34
GDP deflator	-0.77	-2.77	-4.09	-4.73	-4.74
Consumption	0.49	2.14	4.95	7.89	9.52
Investments	-0.03	3.56	4.44	4.20	4.91
Employment	0.36	1.63	3.17	4.85	5.34
Profits	-0.88	-5.99	-10.88	-17.57	-24.94
Labour Productivity	0.05	0.66	2.18	3.59	8.14
Export	0.40	1.95	3.74	6.89	9.45
Import	-0.07	0.28	-0.22	-1.17	-1.69

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

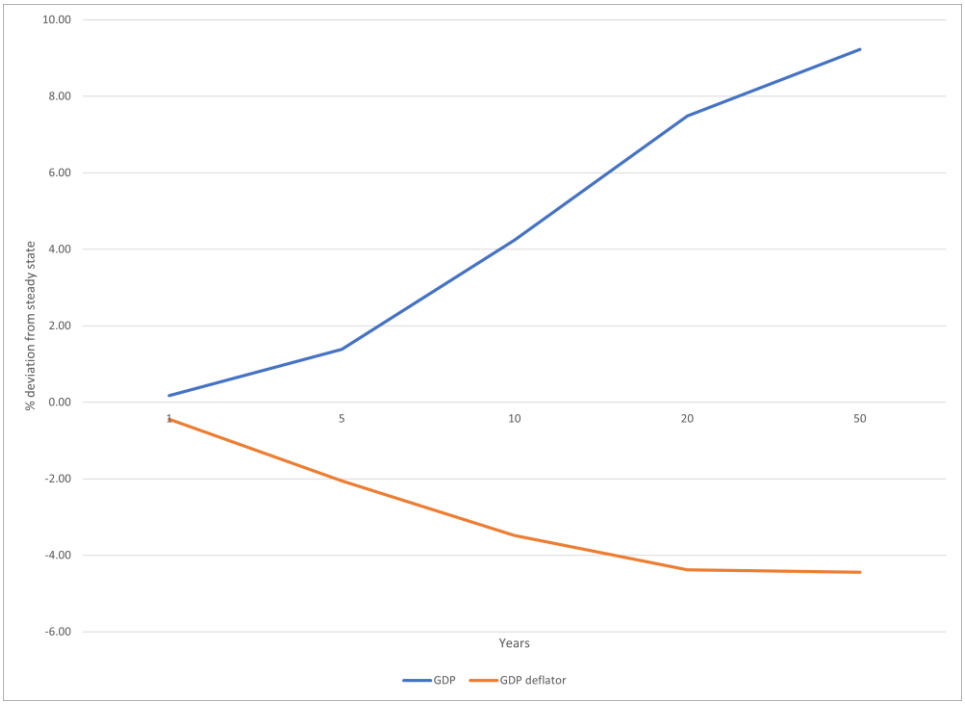
E.8 Simulations' figures

Figure E.5: Scenario Literature-Based Historical to undo a 7.54% markup increase, from 2000



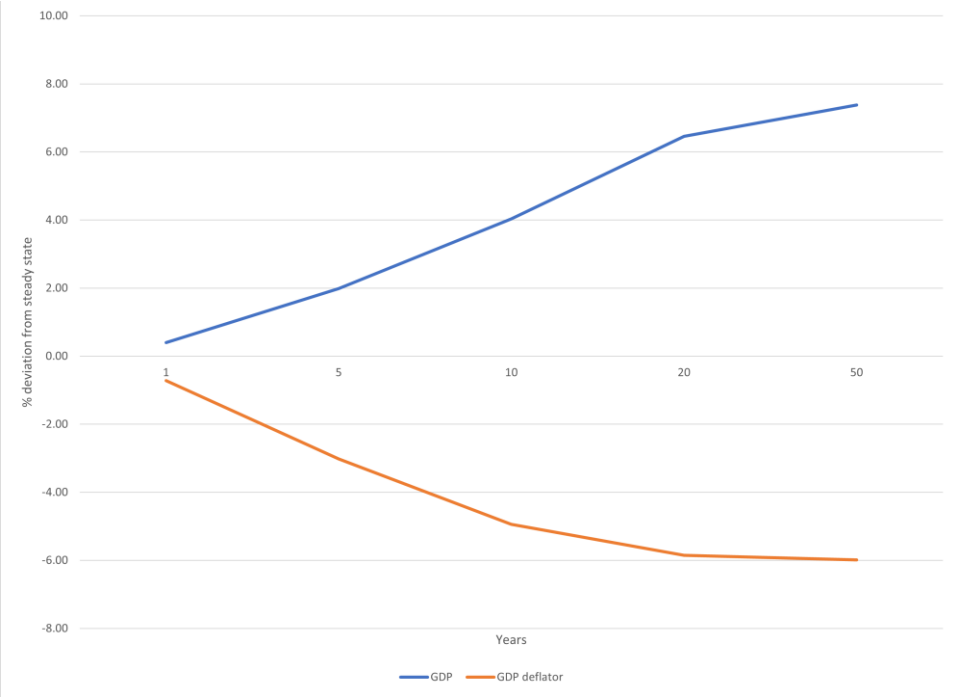
Source: Project Team

Figure E.6: Scenario Literature-Based Historical to undo a 7.54% markup increase & 0.98% TFP change, from 2000



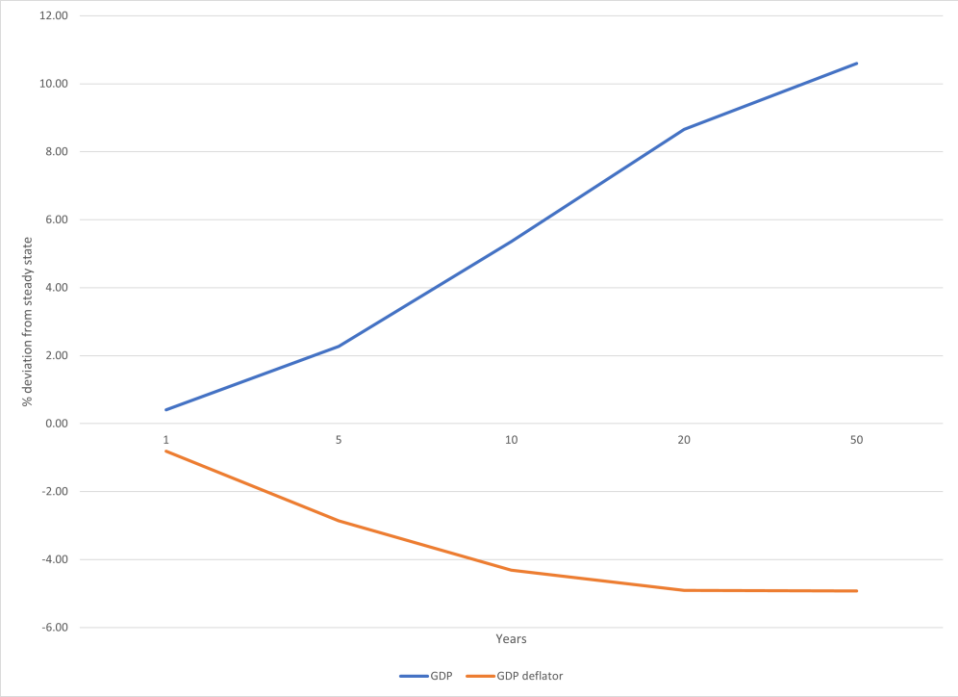
Source: Project Team

Figure E.7: Scenario Trimming - 8.45% markup, from 2022



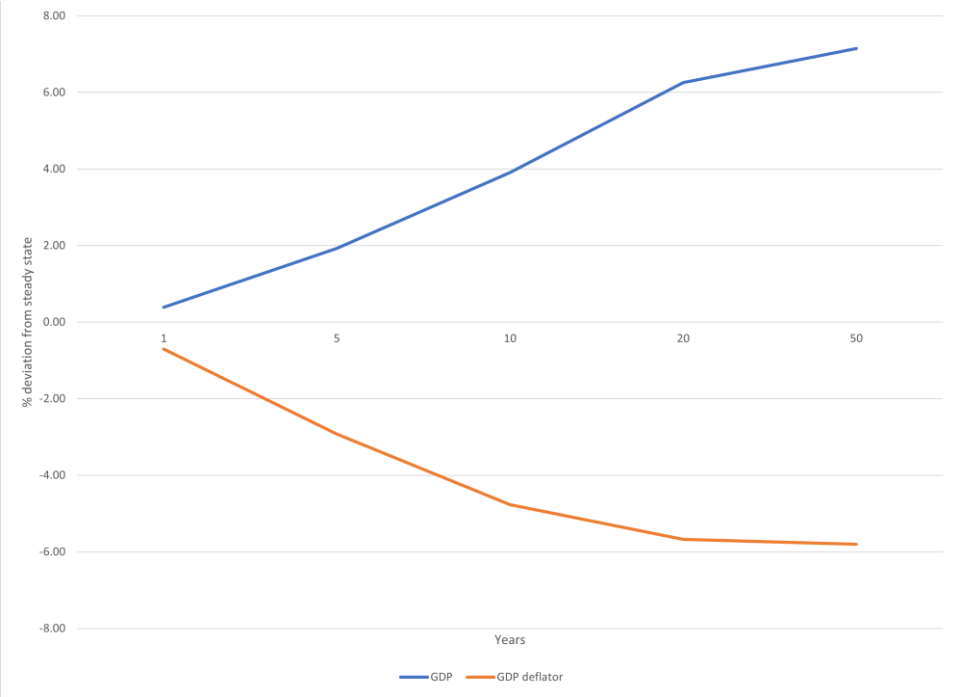
Source: Project Team

Figure E.8: Scenario Trimming - 8.45% markup & 1.10% TFP increase, from 2022



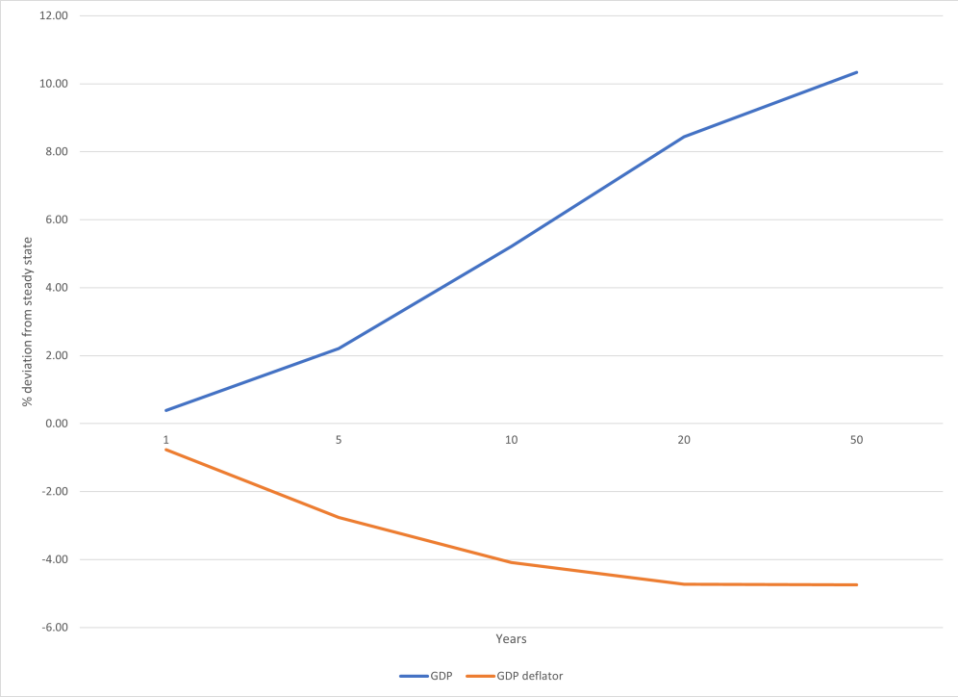
Source: Project Team

Figure E.9: Scenario Convergence -8.38% markup, from 2022



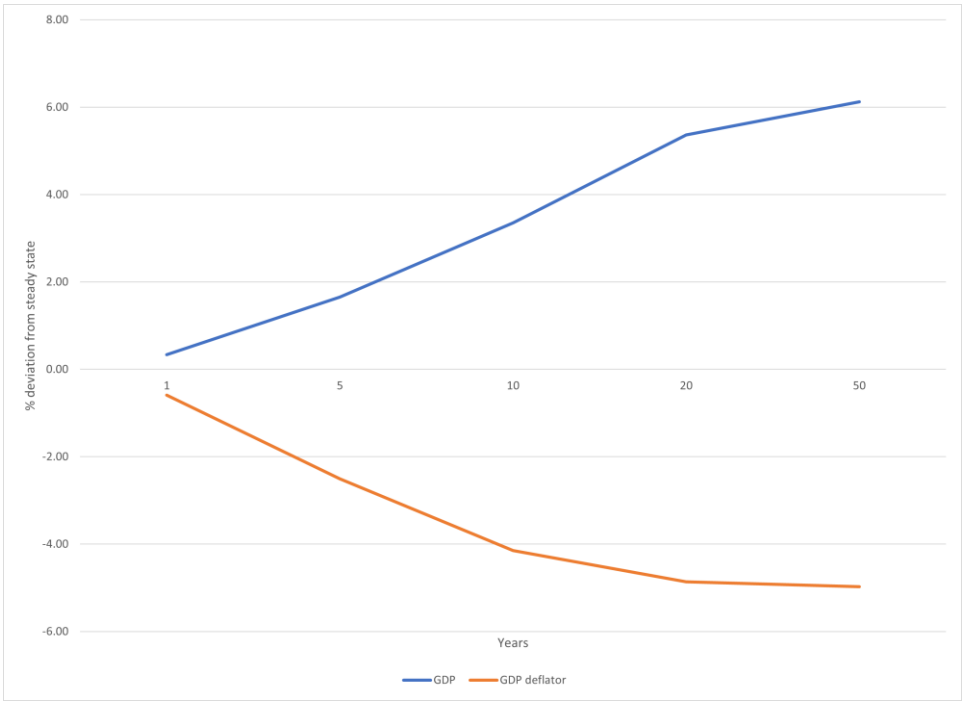
Source: Project Team

Figure E.10: Scenario Convergence -8.38% markup & 1.09% TFP, from 2022



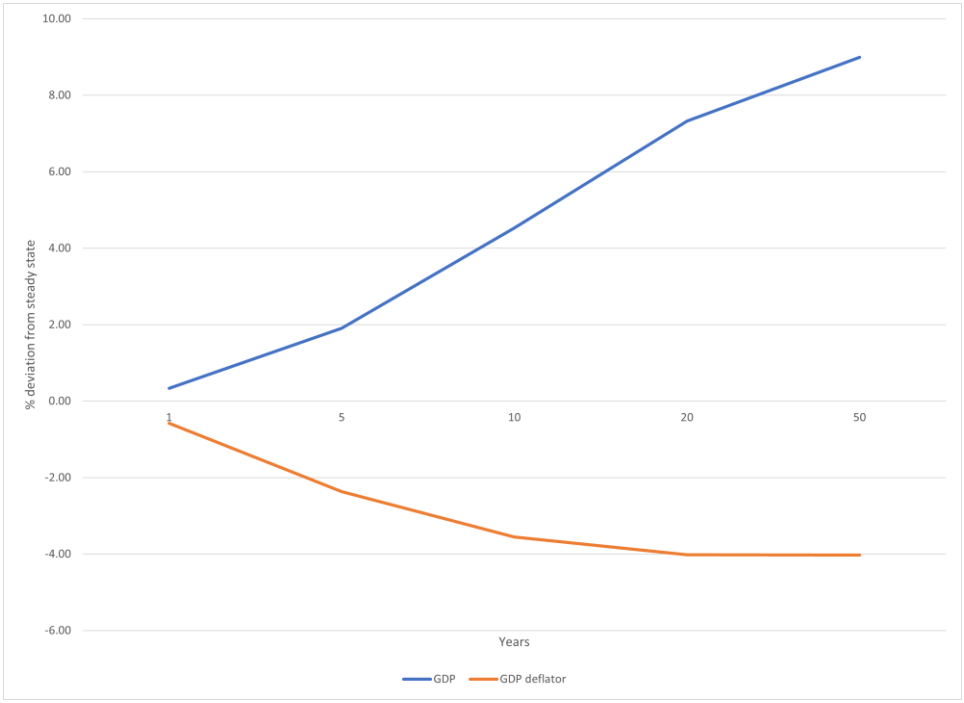
Source: Project Team

Figure E.11: Scenario Literature-Based Future looking -7.01% markup, from 2022



Source: Project Team

Figure E.12: Scenario Literature-Based Future looking -7.01% markup & 0.91% TFP, from 2022



Source: Project Team

Box E.1: Differences between the MATER and QUEST model after a markup shock

To evaluate the comparability between the QUEST III model and the MATER model in terms of results and dynamics after a markup shock, the simulation of a baseline one-time markup shocks of 1.16 p.p. is compared to both models. Table E.8 shows the results comparison for a selection of macroeconomic variables:

Table E.8: Comparison between MATER and QUEST after a -1.16 p.p. markup shock

Years	*1*	*5*	*10*	*20*	*50*
GDP MATER	0.29	0.74	0.93	1.04	1.02
GDP QUEST	0.33	0.56	0.75	0.97	1.08
GDP deflator MATER	-0.29	-0.84	-1.14	-1.32	-1.34
GDP deflator QUEST	-0.24	-0.32	-0.44	-0.53	-0.7
Consumption MATER	0.44	1.01	1.3	1.44	1.44
Agg. Consumption QUEST	0.33	0.48	0.66	0.82	0.96
Agg. employment QUEST	0.26	0.4	0.48	0.60	0.48
Employment MATER	-0.77	0.01	0.44	0.27	0.09
Wage rate QUEST	0.68	1.71	2.09	2.25	2.40
Wage rate MATER	1.66	2.32	2.38	2.62	2.87
Labour productivity QUEST	0.07	0.16	0.27	0.37	0.6
Labour productivity MATER	1.06	0.74	0.50	0.53	0.93
Investment QUEST	0.52	1.09	1.33	1.79	1.71
Investments MATER	-0.02	0.05	0.33	0.51	0.54
Profits QUEST	-8.49	-11.52	-10.89	-12.70	-9.54
Profits MATER	-0.30	-1.60	-2.44	-3.95	-5.77
Real exports QUEST	0.14	0.38	0.59	0.82	1
Export MATER	0.25	0.66	0.83	0.92	0.91
Real imports QUEST	0	0.13	0.12	0.20	0.08
Imports MATER	0.03	0.01	0.08	0.12	0.13
Disposable income QUEST	0.94	2.11	2.57	2.73	2.88
Disposable income MATER	0.89	2.33	2.82	2.89	2.96

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years.

Source: Project Team

Overall, given each model's specificities, the impact is highly comparable.

The impact size and dynamics of GDP after the same markup shock are remarkably similar between MATER and QUEST model. They both predict a moderate increase in GDP after one year, and a gradual increase thereafter. The reaction of final prices (GDP deflator) is also similar one year after the shock, with prices in the MATER model being more reactive after 5 years, until a time horizon of 50 years, when the impact is significantly larger with respect to the QUEST model. This gap derives from a different calibration of the price stickiness in the economy between the two models and by the fact that monopolistic power and consequently the presence of a markup is present in the final's sector in the MATER model, whereas it is in the intermediate sector in the QUEST model.

Aggregate demand increases in a comparable size with some differences in the consumption-investment mix.

The larger reduction in final prices in the MATER model leads to a larger increase in aggregate demand after the shock, compared to the QUEST model. Indeed, the increase in consumption is larger in the MATER model, even though the dynamics are quite similar. This difference in consumption price elasticity between the two models derives a different calibration in the terms of intra-temporal substitution between consumption and labour for the households. Additionally, another channel that pushes aggregate demand in consumption more in the MATER model is that borrowers' agents are credit constrained but can still make some borrowing to finance additional consumption when it is convenient. On the other hand, in the QUEST model households are composed of savers and hand to mouth, with the latter completely without the possibility of borrowing to adjust consumption.

Different consumption and investment elasticities among models can explain the differences.

The more sustained aggregate demand after the shock is the main reason the decrease in firms' profits is smaller in the MATER model than in the QUEST model. On the other hand, the aggerate consumption expands more than investment in the MATER compared to the QUEST model. Indeed, investments after one year slightly decrease and have a moderate increase thereafter, while investments in the QUEST model have a significant increase already after one year and keep increasing afterwards until year 20. Even though firms' profits decrease by less in the MATER model, the supply of funds for investments provided by the households is smaller, leading to the final difference in investments between the two models. It is also worth noticing that real imports and exports follow a remarkably similar path and have close sizes in both models.

Labour income responds similarly among models, the different wage rate reaction explains different employment response.

Finally, the last difference between MATER and QUEST model after the markup shock is in terms of aggregate employment. Indeed, employment in the QUEST model increases more than in the MATER model both in the short and in the long run. This result might seem in contrast with the lager increase in aggregate demand, but to have a complete picture of the final effect on households' disposable income and consequently on consumption, it is necessary to consider both the intensive and extensive margins of the labour market. More explicitly, in the MATER model employment (extensive margin) moves by little, even decreasing after one year, but the intensive margin (real wages) increase significantly, and more than in the QUEST model, leading to a final increase in real disposable similar to the one in the QUEST model. These differences in the reactions of the labour market depend on the fact that

in the MATER model the costs for adjusting employment are calibrated as higher, compared to the QUEST model, even though in line with the literature.

E.9 Additional simulations results

As additional exercise the Project Team simulated the same four scenarios with one-time shocks instead of adopting a phasing-in strategy for the implementation of the shocks. The results are presented in the tables below. Under this exercise, the impact of the markup and TFP shock are propagated to the economy gradually depending on the real and nominal frictions modelled in the MATER model. As it is possible to assess, the effects in the long run converge to the original simulations, while the impact in the short and medium run is about three times larger on average.

Table E.9: Scenario Literature-Based Historical, undoing the 7.54% markup increase from 2000 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.66	2.18	3.73	5.74	6.56
GDP deflator	-1.13	-3.29	-4.47	-5.18	-5.30
Consumption	0.75	2.23	3.85	5.60	6.23
Investments	-0.04	2.26	1.53	1.09	1.66
Employment	0.59	1.69	2.96	4.71	5.23
Profits	-1.29	-6.74	-10.15	-16.05	-22.70
Labour Productivity	0.09	0.49	0.77	1.03	1.32
Export	0.60	1.94	3.32	5.11	5.84
Import	-0.11	-0.01	-0.46	-1.14	-1.32

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.10: Literature-Based Historical, undoing the 7.54% markup increase coupled with a TFP shock of +0.89%, from 2000 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.66	2.47	4.87	7.56	9.22
GDP deflator	-1.13	-3.13	-3.92	-4.40	-4.42
Consumption	0.75	2.39	4.60	7.06	8.47
Investments	-0.04	3.85	3.90	3.59	4.23
Employment	0.59	1.82	2.96	4.45	4.91
Profits	-1.29	-6.74	-10.15	-16.05	-22.77
Labour Productivity	0.09	0.72	1.88	3.08	6.88
Export	0.60	2.17	3.45	6.19	8.38
Import	-0.11	0.28	-0.23	-1.08	-1.52

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.11: Scenario Counterfactual markup shock based on trimming empirical distribution, -8.45% markup shock, from 2022 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.75	2.46	4.20	6.46	7.38
GDP deflator	-1.27	-3.70	-5.03	-5.83	-5.96
Consumption	0.84	2.50	4.34	6.30	7.01
Investments	-0.05	2.54	1.72	1.22	1.87
Employment	0.66	1.91	3.33	5.30	5.89
Profits	-1.45	-7.59	-11.42	-18.05	-25.54
Labour Productivity	0.10	0.55	0.87	1.16	1.49
Export	0.67	2.19	3.74	5.75	6.57
Import	-0.12	-0.01	-0.51	-1.28	-1.49

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.12: Scenario Trimming, -8,45% change in markup & 1.10% TFP increase, from 2022 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.75	2.81	5.58	8.66	10.60
GDP deflator	-1.27	-3.50	-4.36	-4.88	-4.90
Consumption	0.84	2.70	5.24	8.07	9.72
Investments	-0.05	4.47	4.59	4.25	4.97
Employment	0.66	2.06	3.33	4.99	5.49
Profits	-1.45	-7.59	-11.42	-18.05	-25.62
Labour Productivity	0.10	0.82	2.20	3.64	8.21
Export	0.67	2.46	3.89	7.05	9.64
Import	-0.12	0.34	-0.24	-1.20	-1.73

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.13: Scenario Convergence, -8,38% change in markup, from 2022 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.72	2.38	4.07	6.26	7.14
GDP deflator	-1.23	-3.58	-4.87	-5.64	-5.77
Consumption	0.82	2.42	4.20	6.10	6.79
Investments	-0.05	2.46	1.67	1.18	1.81
Employment	0.64	1.85	3.23	5.13	5.70
Profits	-1.41	-7.35	-11.06	-17.48	-24.73
Labour Productivity	0.09	0.53	0.84	1.12	1.44
Export	0.65	2.12	3.62	5.57	6.36
Import	-0.12	-0.01	-0.50	-1.24	-1.44

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.14: Scenario Convergence, -8,38% change in markup & 1.09% TFP increase, from 2022 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.72	2.73	5.43	8.44	10.34
GDP deflator	-1.23	-3.39	-4.21	-4.71	-4.72
Consumption	0.82	2.62	5.09	7.86	9.48
Investments	-0.05	4.37	4.51	4.18	4.89
Employment	0.64	2.00	3.23	4.82	5.31
Profits	-1.41	-7.35	-11.06	-17.48	-24.81
Labour Productivity	0.09	0.80	2.16	3.58	8.10
Export	0.65	2.39	3.78	6.86	9.40
Import	-0.12	0.34	-0.22	-1.16	-1.68

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.15: Future scenario, -7.01% change in markup, from 2022 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.62	2.04	3.49	5.37	6.13
GDP deflator	-1.05	-3.07	-4.18	-4.84	-4.95
Consumption	0.70	2.08	3.60	5.23	5.82
Investments	-0.04	2.11	1.43	1.01	1.55
Employment	0.55	1.58	2.77	4.40	4.89
Profits	-1.21	-6.30	-9.48	-14.99	-21.21
Labour Productivity	0.08	0.46	0.72	0.96	1.24
Export	0.56	1.82	3.10	4.78	5.46
Import	-0.10	-0.01	-0.43	-1.07	-1.24

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

Table E.16: Future Scenario, -7.01% change in markup & 0.91% TFP increase, from 2022 (one-time shock)

Years	*1*	*5*	*10*	*20*	*50*
GDP	0.62	2.35	4.71	7.33	9.00
GDP deflator	-1.05	-2.90	-3.58	-4.00	-4.00
Consumption	0.70	2.25	4.41	6.81	8.24
Investments	-0.04	3.82	3.99	3.71	4.32
Employment	0.55	1.72	2.77	4.12	4.54
Profits	-1.21	-6.30	-9.48	-14.99	-21.28
Labour Productivity	0.08	0.70	1.91	3.17	7.22
Export	0.56	2.06	3.24	5.93	8.19
Import	-0.10	0.30	-0.18	-1.00	-1.45

Note: Numbers are expressed as percentage deviation from the initial equilibrium values. Columns report the impact after 1,5,10, 20, and 50 years. Source: Project Team

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