

Use of Empirical Evidence in EU Merger Control

Lessons from recent cases

Miguel de la Mano
Oficina del Chief Competition Economist, Comision Europea

1. INTRODUCTION

Effective enforcement of competition policy benefits from the rigorous use of economic principles and empirical tools. The use of economic theory and econometric analysis has plays an increasingly important role in the assessment of cases. In part this is due to the Commission's adoption of Guidelines for the Assessment of both Horizontal Mergers (May 2004) and Non-Horizontal Mergers (forthcoming) and also a shift towards an effects-based approach for the assessment of antitrust matters under Articles 81 and 82 of the EC Treaty¹.

Economic models are required in order to determine whether the societal benefits or costs of a proposed merger dominate. The benefits often require economists to undergo on-the-job training about conditions (including relevant transaction costs) that might explain why firms want to merge. It is important not to rely solely on formal economics, but to get one's hands dirty and examine the facts of the situation. In merger cases, therefore, economists often—even must—become experts in the details of particular industries, in order to understand whether or not the merger makes pro-competitive, economic sense.

On the social-cost side of the ledger, the inquiry focuses, of course, on market power, specifically on the way the merger either creates, entrenches or extends market power. Creation or extension of market power translates directly into welfare losses, the primary cost against which merger control is supposed to guard. Market power alone is not sufficient to condemn a merger, since even mergers advancing market power may have countervailing benefits (Williamson, 1968)². Market power, that is, is a necessary but not sufficient condition for a merger to be deemed anticompetitive on net.

2. MARKET POWER AND MARKET DEFINITION

Because market power is a necessary condition, merger cases often begin with an inquiry into its existence. But whether market power exists cannot be determined until the market itself is defined, along both its product and geographic dimensions. These market-

¹ Lars-Hendrik Röller, "Economic Analysis and Competition Policy Enforcement in Europe", in *Modelling European Mergers: Theory, Competition Policy and Case Studies* (Edward Elgar, ed.), 2005. See also Damien J. Neven, "Competition economics and antitrust in Europe", *Economic Policy*, October, 2006.

² Oliver E. Williamson "Economies as an Antitrust Defense: The Welfare Tradeoffs", *The American Economic Review*, Vol. 58, No. 1 (Mar., 1968), pp. 18-36

definition exercises thus permit computation of rule-of-thumb statistics like market shares, which in turn allow inferences about the extent of market power.

To many this seems a separation of antitrust from basic microeconomics, in which markets are not capable of being defined in the sense that they are in antitrust. Market definition in antitrust means drawing bright lines that separate substitute products that compete with one another from those that do not, and drawing bright lines geographically that separate areas in which substitute products do and do not compete with one another. Market definition in that rigid sense is a notion unknown outside the world of antitrust.

But inside that antitrust world, market definition is required by the legal dictates of measuring market power—and so is routinely performed. The demand for highly quantified market definitions is all the greater, given that a Competition Authority's (or a Court's) finding as to market definition often determines the outcome of the entire case. Finding that a particular product sold in a particular place has many substitutes in the same area, or that producers geographically nearby would enter the market and compete away any attempt to increase price anticompetitively, effectively leads to a clearance decision in many cases. Wide product- and geographic-market definitions translate into an absence of meaningful market power, a necessary condition of antitrust liability. In many cases, therefore, the percentage of resources involved in defining markets, relative to the total resources consumed by merger appraisal process altogether, is high.

Once a market has been defined, structural economists (and most competition authorities) instinctively turn next to the question of market share as an indication of market power. In "abuse of dominance" cases, for example, a two step process is employed. In the first step, the court defines the products and firms that comprise the relevant product and geographic markets. According to established case-law, extremely large market shares – in excess of 50% - are in themselves, save in exceptional circumstances, evidence of the existence of a dominant position³. The second step examines whether any anticompetitive conduct exists. This is important to avoid the prosecution of companies who have garnered large market shares from superior product, business acumen, or historic accident.

In merger cases the inquiry is similar. However, in a merger the issue is not the anticompetitive use of market power but rather the possibility that the merger enhances or entrenches market power. As a result of this difference, competition authorities or courts have employed only a one-step test that relies on inferences drawn from post-merger market shares in the relevant market to infer the likelihood of future market power from the merger.

2.1. Factors affecting market power

³ See for example, Case 53/81, *AKZO Chemie BV and AKZO Chemie U.K. Ltd. v. Commission*, 24.6.1982, (1982) ECR 1965

One would think the theoretical case for use of market shares as indicating worrisome market power relatively ironclad, and the authority's use of market shares in antitrust and merger control rather well accepted. However, neither proposition is true. Market-share data are used in oversimplified ways that fail to discriminate among numerous situations with different efficiency implications.

Market share enters into all the standard models in such a way that, *ceteris paribus*,⁴ greater concentration will generally be associated with reduced market performance. This is a basis for inferences about market performance derived from market structure. However market shares are only one of various factors affecting market power.

By definition, in a perfectly competitive market no seller or buyer can influence the price at which transactions occur. A seller is said to possess market power if it can raise price above the competitive level without losing so many sales so rapidly that the price increase is unprofitable. But perfect competition is rarely encountered outside textbooks; almost all firms have some market power, though most have very little. Accordingly, the relevant question in antitrust cases is not whether market power is present, but whether it is important (i.e. substantial).

A precise measure of market power is the Lerner index (or price-cost margin) which measures the degree to which prices exceed long-run marginal costs⁴. Prices above long-run marginal cost lead to both inefficient allocations since consumption will be too low in response to prices that are too high and potentially to inequitable transfers from consumers to producers.

A relationship can be established between several structural factors, including market shares, and the Lerner index. But market shares are not only one and often not the most decisive of such factors. In an oligopoly that includes both large rivals and a price-taking competitive fringe, the Lerner index for an individual firm is given by⁵:

⁴ The Lerner-index L measures the relative difference between price P and (long-run) marginal cost C of the good: $L = \frac{P - C}{P}$. For instance, for a profit maximizing monopoly, Lerner- index is the inverse of the demand elasticity $L = \frac{1}{\epsilon_d}$ and for a perfectly competitive firm, it is zero. Hence, the value of L lies in the range of $\left[0, \frac{1}{\epsilon_d}\right]$. The closer the value of L is to zero, the less the firm has market power, and the closer it is to $\frac{1}{\epsilon_d}$, the more the firm has market power.

⁵ For the derivation of this equation see, for example: Ordover, Sykes, and Willig (1982) "Herfindhal concentration, rivalry and mergers", Harvard Law Review, Vol 95, 1857-1874

$$L_i = \frac{S_i(1+k_i)}{\epsilon_d + S_f \epsilon_f} \quad (1)$$

Where S_i , denotes the market share of this firm; ϵ_d denotes the elasticity of market demand; S_f and ϵ_f respectively denote the market share and elasticity of supply of the competitive fringe and k_i , denotes the “conjectural variation” of firm i . That is, k_i , represents firm i ’s estimate of the aggregate output response by the other non-price-taking firms to a one-unit charge in the output of firm i ⁶.

Equation (1) provides a direct relationship between market performance, in terms of markups, and market share. Higher market share would, *ceteris paribus*, lead to a higher markup over competitive price levels. However, it is also clear that there are other important determinants of market power, namely market power is greater:

- § the smaller is the elasticity of market demand, ϵ_d
- § the smaller is the market share of the competitive fringe, S_f
- § the smaller is the elasticity of supply of the competitive fringe, ϵ_f
- § the larger is the value of firm i ’s conjectural variation, k_i .

Thus, in oligopoly models, the degree of market power, and thus the existence of dominance depends not just on market shares but also on the sensitiveness of consumers to price increases (measured by the demand elasticity) and the ability and incentives of competing firms (large rivals and price takers) to react to price increases, either by entering or expanding output. Firms with high market shares may have little or no market power if price increases resulted in consumers dropping from the market, extensive entry or output expansion by competitors⁷.

2.2. *Derived Demands*

Derived demand is a common situation in which market share inferences cannot even be used. Consider as an example the demand for televised professional football games. Television networks buy rights to televise football games from the Champion League, and in turn sell rights to advertise during the televised games. Television networks are, in effect, reselling an audience of football viewers to advertisers who value access to this audience, say sellers of beer and of power tools. In this sense, the demand for televised

⁶ If k_i is positive firm i anticipates that a contraction of its output will result in a contraction of output by the other non-price-taking firms as well. In contrast, if k_i is negative firm i anticipates that a contraction of its output would be met with an increase in output by the other non-price-taking firms. A value of k_i equal to zero means that the rival firms are expected neither to cooperate nor to compete, but instead to react passively to firm i ’s output adjustments. This is, for example the implicit assumption under Cournot competition.

⁷ For a more detailed analysis of each of this factors (except the conjectural variation term) see the seminal article by Landes and Posner (1981) in the Harvard Law Review Vol 95.

games is derived from the demand for audiences that in turn demand beer and power tools.

What is the relevant antitrust market? The antitrust market must include all the constraints on a profitable increase in the price of rights to televise games. Obviously, a threshold inquiry would be whether other sports, such as college football, would be viable substitutes to the network by attracting demographically similar audiences. However, identifying the next best substitute may not be obvious. Networks may find that the next most profitable substitute is non-sports programming that provides a different audience appealing to different advertisers. For example, networks may find the best alternate use of the time slot is showing soap operas, appealing to audiences that buy cosmetics. It seems odd to include college football and programming that appeals to cosmetics buyers in the same relevant market, but this set of alternatives may best capture the constraints on an exercise of market power by the Champions League. Construction of market 'shares' that meaningfully capture these competitive constraints is, at best, problematic.

2.3. Differentiated products

When products differ in their characteristics, and consumers differ in their preferences for these characteristics, some products will compete more closely than others. This situation poses serious challenges for market share-based analyses. First, it will be difficult to usefully discern the boundaries of the relevant market. The market share approach depends on the implicit assumption that "marked gaps in the chain of substitutes" generally occur in convenient places. That is, the approach assumes not only that the gaps separating included from excluded products are sufficiently wide that all excluded products may be neglected in an analysis of market power, but also that all products within "the relevant market" defined by those gaps are very close substitutes. Often this will not be the case – think for example of battery and manual toothbrushes or paper, which comes in different thickness and qualities.

Second, when competition is 'localized' due to differentiation, market shares may indicate little about the degree of competition among products. For example, consider a market for automobiles in which the two best-selling products are a minivan and a sports car. While the minivan appeals most strongly to practical buyers, the sports car appeals primarily to buyers not motivated by practical concerns. It is likely that the best-selling minivan competes most closely with other minivans, while the sports car competes primarily with other sports models. Therefore, the degree of competition between the two best-selling models would be limited; the best-selling minivan is primarily constrained by the price and features of other minivans (even if their market share is low), and similarly for sports models.

If substantial differentiation can be demonstrated, market share computation is unlikely to yield reliable information, and other tests must be employed to diagnose the importance

of market power⁸. Thus, in the common case of competition among differentiated products, market share analysis is unlikely to produce useful results. In such cases, the most useful analysis involves discerning the pattern and degree of substitution among products and characteristics using the tools of economic analysis.

2.4. Use of Econometric Evidence in Merger Control

The EU Guidelines for the Assessment of Horizontal Mergers (HMG) recognize the above difficulties: market power is not presumed from market shares or market concentration. Under the Merger Guidelines, market concentration analysis (both market shares and HHIs) acts only as a screening device to filter out cases that require no further competitive analysis. No inference is made that large market shares, as reflected in concentration statistics, necessarily mean that market power exists. Instead, the real competitive analysis takes place using the elaborate 'competitive effects' section of the Merger Guidelines that assesses the probability that a merger will either result in anticompetitive coordinated (collusion) or unilateral effects in the future.

Economic and econometric evidence is now regularly submitted in many of the competition policy cases analysed by the Directorate General for Competition (DG Comp) of the European Commission and reviewed by the Community courts.⁹ Such evidence is submitted both by the parties and the Commission's services (in particular, by the Office of the Chief Competition Economist). The next two sections reviews the Commission's recent experience in the use of quantitative techniques both in the delineation of markets and the assessment of competitive constraints.

3. ECONOMETRIC MARKET DELINEATION IN RECENT CASES

Though obviously related, the relevant market for antitrust purposes does not always coincide with the market as it is described in marketing reports, or as it is perceived by the companies themselves. Companies, when thinking of what constitutes the relevant market naturally consider this question from a business perspective. For example, many European companies nowadays operate in several parts of Europe and the world, with a view to expand their business. For them, the relevant geographic market is European, if not global. Similarly, many well-known companies would broadly describe their relevant area of activity as "consumer electronics", "healthcare", or "automotive". Market definition for antitrust purposes starts, however, from a different perspective: what options are open for the customers to acquire the product they wish to acquire? What alternatives do they have? Are they good alternatives? It is this perspective that

⁸ Market shares can be reliable indicators of competitive interaction among brands, when a consumer views a particular product as a next best substitute for any other product. However this assumption is very restrictive.

⁹ Economic evidence is also frequently developed by economists working for both National Competition Authorities (NCAs) and private parties in the Member States and assessed by the NCAs and the national courts.

determines, in large part, whether a company has the ability to exercise market power (e.g. raise price) vis-à-vis its customers, or not.

A useful methodology for assessing economic substitutability has been developed in the form of the SSNIP test, also known as the “hypothetical monopolist test” or “5-10% price test”. SSNIP stands for “Small but Significant Non-transitory Increase in Price”¹⁰. The SSNIP approach suggests the following line of enquiry: Start with the product and area under consideration, postulate a hypothetical small but significant increase (e.g. in the range of 5%-10%) in the price at which that product is made available (the prices of the alternative products are held constant), and assess the likely reactions of customers to that increase¹¹. If substitution away from the product and area by customers would be enough to make the price increase unprofitable because of the resulting loss of sales, then the product in the given area is not a relevant market by itself: there are other products or areas that exercise a sufficient competitive constraint in that they prevent a company, even if it had a “monopoly” on the product, from raising price.

If the price increase of the product is unprofitable, the next step of the SSNIP test is to consider the situation where a company would be the sole supplier of the product under consideration as well as its next best substitute (the product or area to which the greatest proportion of customers switches when the price of the reference product goes up). Would such a company find it profitable to apply a SSNIP? If yes then we stop here and the market is delineated including this substitute product or area. If not we proceed iteratively and include additional substitutes until the market is broad enough that it is worth monopolising, that is to say, an hypothetical monopolist on that market would find it profitable to raise prices¹².

¹⁰ For a more elaborate discussion of the SSNIP test, see Gregory J. Werden, *The 1982 Merger Guidelines and the Ascent of the Hypothetical Monopolist Paradigm*, Antitrust Law Journal, 2003, vol. 71, issue 1, p. 253-276.

¹¹ What price increase is significant or insignificant depends on the industry. In some markets, e.g., the market for crude oil, smaller price increases could already be considered significant. Taking a price increase that is too small would not capture the reactions of all the marginal customers, and might understate the extent of likely customer switching. Using a very large price increase would be likely to capture the reactions of significant portions of the infra-marginal customers. If used as a basis for defining the market, this would lead to very wide markets, hiding otherwise significant competition concerns. The “5-10%” does not constitute a “tolerance level” below which price increases would be acceptable.

¹² The customary economic approach discussed here does not lead to a relevant antitrust market that is unique. This is easy to see: if for a given collection of products over a geographic area a price increase is profitable, this is because the next best substitute does not exercise a sufficient constraining influence; hence a wider market including the next best substitute could also be deemed to be the relevant market as on this wider market too a price rise will be sustainable. It is for this reason that for competitive analysis the antitrust authorities seek to define the narrowest market.

One might be left with the impression that the SSNIP approach is a very “quantitative” tool, and relies on the availability of detailed demand and cost data¹³. In our view, the complexity of the SSNIP test should however not be overemphasized. The most important aspect of SSNIP is its conceptual side, not its quantitative side. Even when there are no detailed data available, it is useful to think of the market definition question in terms of SSNIP. By asking a question which is directly linked to the purpose of antitrust analysis (is the exercise of market power an issue for this collection of products or not?), it brings a certain structure and consistency to the market definition exercise. The SSNIP concept provides for a framework within which to consider the question of economic substitution.

In applying the SSNIP test, and in particular for the analysis of merger cases, the reference price to take into account will normally be the prevailing market price. Special care, however, needs to be taken in the context where the prevailing price has been determined in the absence of sufficient competition. In particular for investigation of abuses of dominant positions, the fact that the prevailing price might already have been substantially increased should be taken into account. If not, this would lead to overly wide markets being defined, and to an understatement of the firm’s true market power¹⁴. In the context of mergers, the proper reference price depends on the reason why there is insufficient competition¹⁵. When it is due to collective dominance (tacit coordination) pre-merger, it would be appropriate to start from the “competitive” level (the price level absent coordination). When the high price is related to a single dominant position, the proper reference would be the prevailing (high) market price¹⁶.

Various quantitative and empirical methods can help to implement the SSNIP test and to shed further light on the degree to which products face demand-side constraints are also available. These methods include the analysis of prices and price movements of the products under consideration to see to what extent they move together over time, event analysis (to see whether particular events in the past shed light on the question of which products compete with one another) or the estimation of price elasticities.

3.1. Price correlation Analysis

¹³ Cost levels matter in view of the profitability question (“would it be profitable to raise price”).

¹⁴ The so-called *Cellophane fallacy* (named after a case in 1956 where a U.S. court overlooked this issue).

¹⁵ See also the U.S. Horizontal Merger Guidelines, Section 1.11.

¹⁶ After all, the objective of market definition is to identify the products that are capable of exerting some competitive pressure on the merging entities’ products, so as to see whether a merger involving these products is problematic from the competition point of view. When the high price is related to a single dominant position, there are no products exerting significant competitive pressure at the “competitive” level (if there were, prices would not be that high). Instead, the focus should lie on identifying the products that exert competitive pressure at the higher price level, to see whether a merger involving these products allows the dominant company to raise price further.

The purpose of price correlation analysis is to identify the extent to which two price series move together over time. If two products or geographic areas belong to the same market, their prices will not move indefinitely far from each other in the long run. The economic intuition is a simple arbitrage argument: if the products are very close substitutes, either on the demand or on the supply side, their prices cannot move too far apart, since either consumers or producers will shift between them in such a way as to eliminate the more expensive one from the market.

However, absolute price convergence is not necessary for products or areas to belong to the same market. Rather it is of importance for market definition to see whether the price behaviour of one product transmits to other in other products or areas. For example two price series for separate geographical areas belong to the same market if the difference between them is stable over time. This notion is closer to the SSNIP methodology. It is the co-movement of prices rather than the law of one price that is of importance in market definition.

The extent of co-movements between two price series can be summarised in their correlation co-efficient. The correlation coefficient will range from minus-one to plus-one. A correlation coefficient of minus one would indicate that the two price series moved in perfect opposition to each other such that whenever one price rose the other fell. A correlation coefficient of zero suggests that there was no relationship between the two price series under investigation. A correlation coefficient of one would indicate perfect co-movement between the two price series, such that whenever one price rose the other rose as well. It is rare to find perfect co-movement between two price series and a correlation coefficient of one is rarely observed. However, the higher the correlation coefficient between two price series the higher is the degree of co-movement between them.

A high and significant correlation coefficient close to unity may indicate that the two candidate markets belong to the same relevant market. A low or insignificant correlation coefficient may indicate that the two candidate markets do not belong to the same relevant market.

There is no absolute limit above which a correlation is deemed to be sufficiently high and there is little guidance on this point in the Commission's case law. A partial, but generally accepted, response to this critique is the use of benchmarking techniques. As a benchmark against which to compare other correlations, one can use the correlation coefficient between the price of two series which one is willing to state on a priori grounds lie in the same relevant market. If the correlation coefficient between the two other products lies above the benchmark this can be interpreted as meaning that these two products lie in the same relevant market.

Limitations

A high correlation coefficient may suggest that markets should be widely defined when in fact the correlation is spurious. Spurious correlation occurs when two series seem to

be correlated but in fact are not. The correlation in this case is a ‘coincidence’ and is not the product of any interrelation between the two products. There are several sources of spurious correlation:

- (i) Price series may display serial correlation. This means that prices charged in the past could affect the level of prices today. If this is the case, then the correlation between two variables will be driven to some extent by each of the prices own serial correlation. In this case, the resulted correlation between the two will be affected by the relation of each the prices with their past values and lead, in this way, to erroneous conclusions¹⁷. This problem can be corrected to a large extent by measuring correlations of the first or second difference in prices.
- (ii) Spurious price correlation arises when two price series are subject to a common influence. For example a high simple correlation can occur as a result of common costs or a common seasonal pattern in the series without the single series being directly related to each other.
- (iii) Correlation techniques may become invalid if applied to variables that are not stationary. A price series is said to be stationary if its mean, variances and co-variances remain constant during the time of reference¹⁸. A price series is non-stationary if it fails to satisfy any part of this definition. Large sample theory breaks down whenever any of the explanatory variables in a regression equation is non-stationary.

Furthermore a low correlation coefficient may lead to a narrow market definition when in fact the two price series are related but subject to significant random disturbances which break such correlation. This can arise because:

- (i) The correlation coefficient can only measure contemporary linear association between two variables. When prices respond to changes in market conditions with a time lag, the correlation between contemporaneous prices will not capture the response of the other goods’ prices to the price change of any given good. Even though the markets are connected, one will observe little correlation. In this case, the use of price correlation tests would cause markets to be defined too narrowly.
- (ii) If the ‘noise to signal’ ratio is high, one will also observe little correlation between the prices. But this result will be driven by random short lived shocks

¹⁷ . In certain cases, series of price are integrated of order 1, which means that the level of the price at certain point in time affects all the all future values reported by this variable.

¹⁸ A series is therefore stationary when a shock that occurs at a certain point in time has not a persistent effect in the following periods.

to the prices of the product and the apparent lack of correlation will not reflect the underlying structural relation between the products. For instance, suppose the inputs are really different for the two goods and input prices move around a lot. Then correlation will be small due to the high variance in the price series caused by shocks to input prices even though the two series may exhibit some co-movement. When the size the shocks is large relative to the movement of the price series over the period observed, this problem will be exacerbated since the ‘noise to signal’ ratio will be high.

Early examples of the role of price correlation analysis in EU merger cases

Price correlation is widely recognised as a useful indicator of whether two products should be considered as forming part of the same market. The Commission Notice on market definition states that for defining product markets:

“There are a number of quantitative tests that have been specifically designed for the purpose of delineating markets. These tests consist of... tests based on similarity of price movements over time...”

“Generally the same quantitative tests used for product market definition might well be used in geographic market definition...”

Price correlation analysis is a technique that has been used in the past by the European Commission in merger cases to establish the extent of the relevant market¹⁹.

The first case where price correlations played an important role was in Nestle/Perrier. In that case high correlation coefficients between sparkling and still water on the one hand and low coefficients between mineral water and carbonated soft drinks helped determining the relevant product market as bottled mineral source water, both still and sparkling.²⁰ In Kali+Salz/MdK/Treuhand (1998) the Commission concluded that potash formed a product market of its own, separate from NPK fertilizers, because the prices of potash and NPK fertilizers had not developed in parallel and followed a completely different pattern.²¹

In Danish Crown/Vestjyske Slagterier (2000)²² the parties presented evidence showing price correlations between Danish prices and prices in Germany, Sweden and France

¹⁹ Price correlation analysis has been applied or discussed in various Commission cases, e.g. Nestlé/Perrier [1992] OJ L356/1, Procter&Gamble/Schickedanz [1994] OJ L354/33, Gencor/Lonrho [1995] OJ 314 and CVC/Lenzing [2004] OJ L 082/20. See for example Nestle/Perrier (Case IV/M190 [1997] O.J. L356/1), Mannesmann/Vallourec/Ilva (Case IV/M315 [1994] O.J. L102). It is now almost routine.

²⁰ M.190, at para 16

²¹ M.308, at paras 25-28

²² M.1313, at para 84.

which were generally higher than 0.9. The Commission rejected the argument that these correlations coefficients indicated the existence of a wider Northern European or Community market for pork because, inter alia, the Danish prices are to a certain extent automatically correlated with export prices due to the way the Danish slaughterhouse optimise their revenue stream. According to the parties, the sales department of a slaughterhouse will always sell a given quantity of meat wherever it will receive the best price. This creates an incentive for the slaughterhouse not to sell at a cheaper price in Denmark than on its export markets. Therefore, prices in Denmark and on export markets would be expected to move together.

As mentioned above, common costs, a trend such as inflation can make the correlation spurious. In Mitsui/CVRD/Caemi (2001), the Commission concluded that three forms of iron ore were highly correlated due to common costs, since they were produced in the same mining areas with the same equipment.²³ In Gencor/Lonrho (1996) the Commission stated that high correlation between the prices of gold and platinum was due to a trend, and therefore automatically correlated.²⁴ The Commission used co-integration analysis to neutralise the trend and concluded that the two metals were in separate product markets.

In Blackstone/Acetex (2005) the parties submitted a price correlation analysis to support their claim that the market for acetic acid was worldwide. The Commission analysed the data and considered that the correlation might be spurious, due to the presence of common factors not included in the parties' analysis. In response, the parties submitted a second study that used cointegration and Granger causality analysis to show that there is a long term relationship between the prices in the different world regions. This, however, was not sufficient to convince the Commission, which in turn analysed the model and found that it was incorrectly specified and concluded that the results of the two studies were inconclusive.²⁵

A recent example: Ryanair/Aer Lingus (2007)

More recently in the Ryanair/Aer Lingus case the Commission used price correlation analysis as one indicator of whether the geographic market definition of short-haul routes out of Dublin should include one or more destination airports in the proximity of each other. The Commission relied on data on average monthly prices across a number of routes between Dublin (and Cork & Shannon) and other European destinations where there are potential horizontal overlaps, either because the merging parties fly to the same airport or because they fly to different airports in the same geographical area.

The Commission calculated correlation coefficients for a number of related airport-pairs where sufficient time series data was available. Price correlations are of three types. A

²³ M.2420, at para 119

²⁴ M.619, at para 52

²⁵ M.3625, at para 35.

first category of price correlations concerns the situation where both Aer Lingus and Ryanair both serve the same airport. A second category concerns situations where Ryanair serves two different airports in close proximity to a given destination. Finally, the third category refers to the situation where Ryanair and Aer Lingus serve different airports close to a given destination.

As a first benchmark the Commission considered the average correlation on the routes where both Aer Lingus and Ryanair fly to the same airport. For such routes the average correlation was 0.69. The Commission then calculated the correlation coefficients for all the routes included in the sample where Ryanair and Aer Lingus were serving different airports close to the same main destination city. In those cases where the correlation coefficient was above the benchmark the Commission considered this is an indication that the route included the two airports in the same geographic market.

The Commission acknowledges the limitations of price correlation analyses identified above. Prior to computing the correlation coefficients the Commission relies on a number of statistical tests (e.g. Augmented Dickey-Fuller' (ADF) test) to determine whether the relative prices are stationary. Calculation of the price correlation coefficient raises no concerns when the underlying price levels are stationary. However, when the series are non-stationary this may result in spuriously high correlation coefficients even though the series may not be significantly correlated. When price levels are non-stationary it still makes sense (and is valid statistically) to calculate the correlation coefficients of the price changes, that is, correlations of the transformed series $\Delta p_{it} = p_{it} - p_{it-1}$ if the series are integrated of the same order. In this situation the economic interpretation of the correlations differ because it is the price changes rather than the price levels that potentially will correlate. In this case, it is relative convergence that is being tested. A "high" correlation of price changes across products or services for different geographical areas still indicates that these prices co-vary and hence suggests products belong to the same geographical market.

The Commission corrects for seasonality by introducing quarterly dummies in the least squares regression. This is done in order to account for possible seasonal variation in the data. The Commission indicates that partial correlation coefficients should be preferred to the standard simple correlations. The partial correlation coefficient differs from the ordinary correlation coefficients, as the former, but not the latter, has been purged from the influence of common factors. The partial correlation coefficient (PAC) is calculated by regressing all price series on time series of the price of fuel using OLS. The residuals from this regression are considered as a measure of prices purged for common factors and the partial correlation coefficient is the ordinary correlation coefficient between the residuals from two such regressions²⁶. Further the Commission included lagged values of

²⁶ If the correlation between two price series is simply spurious it is typically seen as the simple correlation being relatively large whereas the partial correlation controlling for common costs is relatively small. In general, however, the partial correlation coefficient can be either smaller or larger than the simple correlation coefficient and the coefficients may not even have the same sign even though one would expect this in most cases analyzing price data.

wholesale prices in the estimations, to correct for detected serial correlation in the residuals - this implies past values of wholesale prices influence current values.

3.2. Event Analysis

Relevant information for the purpose of market definition can be also derived from the analysis of past “events” or “shocks” occurring in the industry²⁷. The idea is to consider the event, and to see how customers and/or companies reacted to it. Typically, but not necessarily, this analysis would involve some type of econometric analysis.

The “events” can be of various sorts. An important type of event is past market entry. For instance, if following the market entry by a company A, company B lost many sales, but company C’s sales remained constant, then it may be concluded that A and B’s products are in the same relevant market, and C’s products are probably not. This analysis may also be applied on a more general basis, to see which products are closer substitutes to each other than others. If B’s sales reacted a lot, but C’s sales much less, then one could conclude that products A and B are closer substitutes than products A and C.

Other examples of “events” include supply shortages, shocks in input prices, regulatory intervention, technological change, and promotional and advertising activity. For example, if a promotional activity on one branded good (e.g. a strong advertisement campaign, or heavy discounting) resulted in a capture of market share of one other brand in particular, this may be taken as evidence that those two goods are in close competition with each other.

Early examples of the use of Event Analysis

The leading case concerning the early use of event analysis is Procter & Gamble/VP Schickedanz (II, 1994).²⁸ In that case the Commission had to decide whether sanitary towels and tampons were in the same product market. The market introduction of the sanitary towel •Always• by Procter & Gamble in Germany was used as a natural experiment to study its impact on both sanitary towels and tampons. The examination of the prices of both products revealed that 2.5 years after the launch of “Always”, prices of tampons had risen sharply by 18.2%, while the prices of sanitary towels had only risen by 2.3%. These price movements clearly suggested that the new brand was seen as an alternative to other sanitary towels but not to tampons. This conclusion was supported by the evolution of the ratio between the sales of towels and tampons in Germany. The split between towels and tampons had remained constant at roughly two thirds for towels and one third for tampons. “Always” reached its market share of 11% solely at the expense of

²⁷ This type of analysis has been applied in some Commission cases, e.g. *Procter&Gamble/Schickedanz* [1994] OJ L354/33, and *Kimberley Clark/Scott* [1996] OJ L 183/1. Obviously, the industry under investigation must have witnessed an “event” in order to apply this technique.

²⁸ M.430, at paras 63 and 64

other towels. Therefore, the Commission concluded that there were indeed clearly separate markets for sanitary towels and tampons.

In *Rexam/American National Can* (2000), the Commission considered whether beverage cans made from aluminium formed a separate market from beverage cans made from steel.²⁹ The price of the main input, aluminium sheet, had changed substantially. However, the price of aluminium beverage cans did not increase. Instead, prices of aluminium beverage cans were sensitive to changes in the prices of steel beverage cans. Therefore, the Commission concluded that beverage cans made from steel and aluminium were part of the same product market.

A recent example: Blackstone/Acetex (2005)

In the *Blackstone/Acetex* case the question considered was whether Western Europe is a distinct geographic market for Acetic Acid and VAM, two commodity products. That is, do producers located in Europe can successfully collude and impose a small but significant and non-transitory price increase. If as a result of a price increase in Western Europe, imports from the rest of the world rise significantly, it is unlikely that the hypothetical monopolist would be able to restrict output to increase price. Alternatively, the presence of substantial transportation and storage cost as well as duties may inhibit trade flows.

To resolve this question the merging parties submitted a shock analysis. They study the effect of unexpected plant outages for both VAM and Acetic Acid in all three regions, North America, Western Europe and Asia. They argued that an unexpected plant outage that has an effect on local prices and on prices in other regions is evidence of interlinkages between the different regions. This would indicate that the three regions are closely knitted together, and therefore these different areas constitute a global geographic market. The parties proposed an ad-hoc econometric model to determine the impact of unexpected local plant outages on prices in the different regions at issue. The dependent variable measures the percentage change in price of both VAM and Acetic Acid. As a result, the coefficient estimate should be interpreted as the effect of an unexpected plant outage on the percentage change in prices.

The results submitted by the parties suggested that Western Europe cannot be considered a separate antitrust market for VAM and Acetic Acid. The Commission replicated the results of the econometric estimation and then undertook various robustness checks. It concluded that the econometric analysis confirms that Western Europe cannot be considered to be a separate anti-trust market for VAM. Unexpected outages have a positive impact on imports from North America. Because of a lack of data, the results were inconclusive for imports coming from Asia. With regard to acetic acid, the number of outages were small. The results however indicated that outages in Western Europe had an impact on the overall level of imports into Europe (mainly from the US). The results

²⁹ M.1939, at para 12

therefore indicated that Western Europe is not a relevant geographic market. North America should be included in the relevant geographic market

3.3. Analysis of price elasticities

The price elasticity is a summary indicator of the extent to which a product is subject to competitive constraints (due to customer reactions and the presence of competitors). When the price of a product is raised, customers switch away from it: they either switch to competing suppliers, or they stop purchasing the product altogether. The (own) price elasticity of a good captures both these movements³⁰. The higher the own-price elasticity, the more the product is subject to competitive constraints. Alternatively, the lower the own-price elasticity, the higher the degree of market power for the supplier concerned³¹.

The Commission has calculated own-price elasticities in a number of cases. In Gencor/Lonrho (1996) the own-price elasticity of platinum was found to be below one [-0.6], which led the Commission to the conclusion that given the inelastic demand for the metal it is a separate product market.³² Similarly, in UPM-Kymmene/Haindl (2001), the Commission estimated the demand elasticities with regard to the publication paper market. Estimated elasticities were in the range of -0.15 to -0.3 for newsprint and -0.3 to -0.6 for wood-containing magazine paper, indicating that the two constituted relevant product markets.³³

The *cross-price elasticity* measures how demand for a product changes with the price of some other product. For a set of products, there is an array of cross-price elasticities, each corresponding to an individual pair of products. The cross-price elasticity between competing products is normally positive (if the cross-price elasticity is zero, then the products concerned are not competing). Generally, the higher the cross-price elasticity of B with respect to the price of A, the more product B forms a competitive constraint for product A. Cross-price elasticities are thus particularly helpful in evaluating the “closeness” of substitute products (relevant both for market definition and for evaluating possible unilateral effects arising from mergers).

If however the cross-price elasticity is negative, a rise in the price of product A would cause consumers to also buy less of product B and the two products are said to be

³⁰ The own-price elasticity of a product is defined as the percentage change in the quantity demanded that follows a one percent increase in the price of a product. An own-price elasticity in absolute terms of less than one is deemed inelastic, while a value of above one is called elastic. If demand is inelastic, e.g. has a value of 0.5, then a price increase of 5-10% becomes profitable, because an increase of say 10% will lead to a loss in sales of only 5%.

³¹ Note that the own-price elasticity of a product is normally higher than 1.0. If it were lower, e.g. 0.5%, the supplier of the good could make more money by raising its price (a price increase of 1% would result in only 0.5% less demand, and hence lead to a net increase in profit).

³² M.619, at para 56

³³ M.2498, at para 88

complements. Complements are not part of the same product market but belong to related markets. However, cross-price elasticities must not be seen in isolation. It is perfectly possible to find that the cross-price elasticities for all possible substitutes are positive but very low. That does not necessarily mean that the relevant market is confined to the candidate product and the hypothetical monopolist has market power. On the contrary, the own-price elasticity could be quite high in this case, because many weak substitutes could jointly defeat any price increase of the candidate product. It is always the own-price elasticity which is decisive for the determination of the relevant market. The reason is that the own-price elasticity includes all cross-price elasticities. Only if the own-price elasticity is low the hypothetical monopolist has market power and can increase prices profitably.

Measurement of elasticities

Information on elasticities can be obtained in various ways³⁴. Some rudimentary information can result from customer surveys which ask the question “in the face of a 1% price increase, would you switch? If so, by how much?” If, out of a 100 respondents, five indicate that they would switch away half of their demand to other suppliers, this could indicate that the own-price elasticity of the product in question is about -2.5% (assuming the respondents are more or less of equal size). The same question can also be asked for a group of products to see what the elasticity is for the group as a whole³⁵.

An issue with surveys is that the results should be representative for the larger group of customers. This is not always easy to achieve, if only for practical reasons (one may need a substantial group of respondents to have representative results). Further, the questions asked should be accurate enough, so that they leave relatively little room for misinterpretation. Finally, the question is - by definition - a hypothetical one: “what would you do if”. The answers from respondents to a survey are unlikely to be as well thought through as business decisions in case of real price increases. With these caveats, however, surveys remain a useful tool, and certainly a good starting point.

Further (and more affirmative) information on switching behaviour can be obtained from looking at actual decisions to switch in the past. If there are quite a few respondents that indicate they have switched in the past to take advantage of price differences between products, this signals that the elasticity for a particular product (or set of products) is likely to be substantial.

The standard statistical tool used by economists to find and evaluate a relationship between observed data points is *regression analysis*. Broadly speaking, regression

³⁴ The Commission considers price elasticities mostly on the basis of surveys. The more sophisticated regression techniques have been applied or discussed in, for instance, *Procter&Gamble/Schickedanz* [1994] OJ L354/33, *Guinness/Grand Metropolitan* [1998] OJ L288/24, and *TetraLaval/Sidel* [2004] OJ L 43/13.

³⁵ A small but significant minority of switching customers may already be enough for the own-price elasticity of a product to be substantial. See Section D.

analysis aims at identifying a line through data points that provides the best fit, i.e. which minimises the differences between the actual observations and the plotted line³⁶. It then evaluates whether the differences between the actual observations and the plotted line are substantial or not, in view of the number of data points available. The better the “fit”, the more “precise” the estimated relationship can be deemed to be.

Regression analysis also can be used to help us test hypotheses. For example, a regression analysis could be used to test whether or not two products are, in fact, substitute products. One hypothesis that can be tested is this: products A and B are not substitutes, which means that the cross-price elasticity is (close to) zero. A regression analysis can help us test this hypothesis by providing an estimate of the cross-price elasticity between products A and B along with the standard errors of the estimate.

3.3.1. *Example: Omya/Huber*

In the Omya/Huber case the merging firms produce and sell calcium carbonate, an industrial mineral largely used as *fillers* in the paper manufacturing. A key issue was to determine whether two types of fillers, ground calcium carbonate (GCC) and precipitated calcium carbonates (PCC) belong to the same relevant market. The notifying party claimed that sales of PCC form a distinct market, a market definition that produces a minimal overlap, while third parties argued that GCC and PCC are considered interchangeable by customers. The Commission estimated an econometric model that was used in conjunction with other pieces of evidence to take a view on the delineation of the relevant market.

Because logistic and transportation costs are important considerations in this industry, paper mills purchase GCC and PCC from plants that are sufficiently close. It follows that a plant will face less competition if its rivals are located at greater distance in comparison to a plant that has many plants in its vicinity. Spatial differentiation appears to be therefore an important consideration for market definition and the competitive effect of the transaction.

The Commission's empirical study applies a discrete choice approach to estimate the substitution patterns between the various producers of carbonates filler. The purpose of this exercise is to determine to what extent GCC and PCC are choice substitute and furthermore to what extent the merging parties, Omya and Huber, were close competitors prior to the transaction. The results of econometric model should shed light on the post-merger competitive effect of the transaction.

³⁶ To measure difference, one can use the absolute differences between the observations and the plotted line, or other measures of difference. The most practical method has proved to be to take the squared differences, and to draw a line such that the sum of the squared differences is minimised. This method is called Ordinary Least Squares (OLS). Statistical tests have been developed for the OLS method, and its variants.

The model adopted in this study assumes that each paper mill will select a supplier of filler calcium carbonates that is located within a certain geographic distance³⁷. In a discrete choice model the decision maker must select only one alternative between mutually exclusive alternatives³⁸. For this industry, each paper mill chooses between different mineral plants for its requirement of filler calcium carbonate. The fact that each paper mill tends to be supplied by a single plant for its filling requirements of calcium carbonates makes the discrete choice framework highly appropriate.

To delineate the choice set of each customer, the Commission applies a rule based on a maximum distance between each paper mill and all mineral plants located within the EEA. All plants located beyond that maximum distance are excluded from the choice set. In other words, it is assumed that the probability that a plant located beyond that distance serves a customer is simply zero.

The maximum distance will vary depending on the mode of transportation. When the mode of travel is trucking, it is assumed that plants located farther than 700 km from a paper mill cannot be included in the choice set of that particular customer³⁹. Merchant PCC plants have the capability of shipping PCC with much less water content, which substantially lowers the costs of transportation. The maximum distance for these alternatives is thus higher, and is set at 1,000 km. When nearby seaport facilities are available, plants can ship calcium carbonates by sea. This mode of transportation is more economical, and the average distance travelled is longer than that achieved by trucks. Finally, the study considers the possibility of shipping filler carbonates via rail with a maximum distance of about 800 km. As a result of these assumptions each paper mill, depending on its location, has a unique choice set. The probability of a paper mill selecting a plant beyond these maximum distances is sufficiently close to zero that these alternatives can be discarded.

The choice set of each individual paper mill contains PCC or GCC plants owned by different firms. In terms of volume shipped, the number one producer of GCC in the EEA is Omya, and Imerys is second. There are also some minor producers with only a few small plants such as Provençale and Reverté. However, because the number of shipments collected was few for these two producers, they were dropped entirely. In the EEA PCC for the paper industry is supplied by JM Huber, Omya, SMI, Solvay and Schaeferkalk.

³⁷ This assumption is born by the reality of the marketplace. Suppliers and customers have indicated that transportation costs constrain the ability of shipping GCC and PCC. This is also verified in the data gathered by the Commission. The choice model predicts the probability that a paper mill choose a particular supplier within its relevant geographic zone.

³⁸ McFadden (1974) introduced the conditional logit to estimate a choice model. For a thorough introduction of discrete choice model, their properties and estimation techniques we refer the interested reader to Train (2002) and Greene (2003) chapter 21.

³⁹ GCC or PCC are transported by trucks each carrying a load of 14 to 20 dry metric tons.

Because the dataset contains very few observations for Solvay and Schaeferkalk, observations for these two producers were also dropped.

The study uses a nested logit to model the probability that a paper mill selects a supplier of filling mineral as a function of the producer plant characteristics and the customer's (paper mill's) own characteristics while allowing for unobserved heterogeneity in preferences over the producers' offer⁴⁰. The Commission also motivates the assumption that PCC products are more similar than GCC products, and combine these alternatives together in one nest. For the nested logit, the probability that a paper mill n select plant j in nest k is commonly presented as the product of two probabilities:

Dummy variables for each supplier are also included in most of the empirical specifications of the model. These variables should capture unobserved attributes for this producer such as customer relationship, image etc. The model also includes dummy variables for the types of GCC. The raw material for GCC is chalk, limestone and marble. Chalk GCC is usually cheaper and provides lower brightness levels.

As expected the results show that longer distance affects negatively the chance of a plant to supply customers. However, when transportation is done via ships, this tends to annihilate the distance factor. The nested logit specification adopted by the Commission models the choice probabilities as function of observed variables. Once such a model is estimated it is useful to know the extent to which these probabilities vary in response to a change in price. The coefficient estimate of the price variable is not directly interpretable. The Commission reports the changes in terms of semi-elasticities. That is, by how much the choice probabilities are altered for a 1% change in price. To compute the own price elasticities the Commission focuses on customers who are actually selecting the alternative in question.

The estimated own-price semi-elasticities suggest that current Omya customers would on average rapidly switch to another supplier should Omya raises its price by 5% or more. The estimated cross elasticities suggest that when Omya increases its price, its current customers are more likely to switch on average to Imerys than to other suppliers. The cross-price elasticities for Imerys's current customers reveal that following a price increase these customers are more likely to switch to Omya GCC than to other suppliers. This result tends to indicate that GCC customers would prefer first another GCC supplier.

4. ECONOMETRIC ASSESSMENT OF COMPETITIVE CONSTRAINTS

⁴⁰ For further details see Durand and Pesaresi (200X)

4.1. Quantitative analysis in bidding markets

Often, whatever the operational formulation or the test employed, the appropriate boundaries of the market cannot be decided precisely. Market definition is particularly difficult in bidding markets. In essence, these are markets where companies compete for specific contracts. The term “bidding market” covers both situations where customers use formal bidding rules (as is the case in public procurement) and situations where customers simply elicit bids from sellers during negotiations.

The competitive analysis of bidding markets poses a number of challenges and opportunities for a competition authority and also for merging parties. On the one hand, bidding data often provides useful insights into the competitive dynamics of a market and potential merger effects. On the other hand, structural indicators, such as market shares and HHIs, may have little or no connection to market power in a bidding market.

In each particular bidding contest, there is normally only one winner. The fact that another firm did not make a sale in a particular bidding contest, does not mean that this firm did not pose a significant competitive constraint on the winning firm. In such a case, market shares (which give an indication of the firms’ success in bids) may not be a good reflection of the competitive significance of firms, especially when the number of bids in a given year is small (when the number of bids gets larger, one can expect market shares to better reflect competitive strength).

It follows that the link between market share and market power is probably less direct in bidding markets than in most other markets. In bidding markets each customer gets, or may get, a personalised offer. Where this is the case, companies can decide to compete more aggressively on the margin, without this necessarily having a direct impact on the margins obtained on their existing customer base. Especially when individual contracts are large and infrequent, the incentive to compete for each of them may be strong.

Accordingly, in bidding markets it is useful to seek direct information on the importance of the respective market players in the bidding process, and to see whether market shares overstate or understate market power. Three forms of bidding analysis are often applied, mostly with a view to establish which firms have been competing strongly against each other for certain types of contracts⁴¹:

- *Frequency of encounter analysis* consists in counting how often specific firms meet. For example, if firm A meets firm B more than 80% of the time in those bids in which it participates, but firms C and D only 30% and 20%, respectively,

⁴¹ Bidding data have been analysed by the Commission in a number of cases, for example *Boeing/McDonnell Douglas* [1997] L336/16, *PriceWaterhouse/Coopers&Lybrand* [1999] L50/27, *Philips/Agilent* [2001] C 92/10, *GE/Instrumentarium* [2004] L 109/1 and *Oracle/Peoplesoft* (2004, not yet reported).

this can be an indication that firms A and B are “close” competitors for the customers they supply⁴².

- *Runner-up analysis* seeks to provide more accurate information on the “closeness” of competitors by looking at the number of times a company A has come second when company B won a bid, and vice versa. The more often two companies have put in the two most competitive bids, the more they represent the main competitive threat to each other.
- *Price impact analysis (discount analysis)* investigates whether the number (and possibly the identity) of bidders present in a bid has a significant impact on the prices (or discounts) being offered. When prices are, on average, higher when the number of bidders is low, this indicates that the number of bidders in the market matters, and that a merger may lead to price increases. One can also investigate whether the prices offered by a company A tend to be lower when company B is bidding as well (and vice versa). This would give an indication of the likely price impact of a merger between companies A and B.

Also in this context one should compare “like with like”. When the contracts are very diverse, it is probably better to compare discounts than prices (discounts normally vary less with differences in the actual contract to be performed). Even then, however, one still needs to be aware of factors influencing the level of discounts, such as the value of the deal (large values usually attract large discounts).

Examples of merger involving bidding analysis

The Siemens/Drägerwerk m brought together the two leading players in Europe in medical ventilators and it also led to high market shares in anaesthesia delivery systems. Apart from leading to high market shares, the transaction also removed a particularly close competitor, therefore significantly increasing Siemens/Dräger’s market power vis à vis its customers (hospitals). The market concerned had undergone a significant consolidation in recent years, as the main players had become bigger through the acquisition of the smaller manufacturers to the extent that they could offer a wide range of medical equipment to hospitals. Whilst many hospitals welcomed the increased efficiency of a “one-stop-shop” on the supply side, they were also concerned that competition would be significantly reduced. In response to the competition concerns raised by the Commission, the parties undertook to divest Siemens’s Life Support Systems unit, which includes the company’s world-wide anaesthesia delivery and ventilation business. This removed the horizontal overlap between the activities of Siemens and Dräger in this field.

⁴² Note that such a pattern may be perfectly compatible with a market context where all four firms have equal market share (25%). For instance, companies C and D may meet each other more often (and secure more wins) in bidding contests for other customers.

The medical equipment in the Siemens/ Dräger transaction involved highly differentiated products. Most purchases were made through bidding contests for tenders published by hospitals. Physicians were found to have very strong preferences for certain products, which was reflected in the tender specifications. The preferences appeared to be based on a combination of technical requirements for a given clinical area (e.g. intensive care unit, operating theatre, emergency transport, etc.), but also soft factors like staff's personal experience, ergonomics, etc. Given the safety-critical nature of the products, medical staff appeared to have significant leverage over hospitals' commercial departments when setting tender specifications.

As a result, significant information about suppliers' product positioning could be gained from the identity of bidders involved in bidding contests. Given that participation involves costs, and knowing that hospitals would only accept fully-compliant bids, only companies that meet a given tender specification would be expected to submit a bid. The parties' frequent interaction in bidding contests, relative to other competitors, therefore provided strong evidence that they supplied close substitutes. The conclusions from the bidding analysis were complemented by a market survey and companies' internal documents, which together formed a robust case.

A few months later the Commission had to assess the merger between GE and Instrumentarium, also strong players in the medical equipment market. The Commission in this case attempted to estimate quantitatively the price impact of a merger in various product markets. Bidding analysis played an important role, among other elements, particularly in the market for perioperative patient monitors, which was one of several markets affected by the transaction. Perioperative patient monitors are used in the perioperative area, i.e. primarily in the operating rooms as well as in the induction and recovery rooms, in order for anaesthetists to monitor the patient's vital signs.

Apart from leading to high market shares in several Member States, the transaction had the effect of reducing the number of credible competitors from four to three (GE/ Instrumentarium, Siemens and Philips). Nevertheless, the question arose whether the merger was bringing a significant change to the market. GE's position on the perioperative monitoring market was not as strong as that of Instrumentarium, and the overlap was therefore limited, ranging from 5% to 15% depending on the country.

Competition in the market for perioperative monitors was driven primarily by product differentiation, whereas capacity constraints appeared to play no significant role in manufacturers' decisions on price and quantity. Individual customer preferences were reflected in the technical specifications of the tender limiting the number of eligible bidders for a specific project to those suppliers meeting the given set of requirements. According to the Commission's market investigation, winning bids were not necessarily allocated to the lowest-price bidder, but to the supplier that best meets the individual hospital's requirements on both technical and economic grounds. Anaesthetists effectively played a key role in selecting equipment.

Given the specific features of this case, the Commission sought to supplement its qualitative assessment with statistical and econometric analyses of past tenders. This exercise was aimed mainly at gathering additional evidence to estimate the competitive constraints that the various players, and in particular the merging parties, exercised on one another. The Commission thereby went a step beyond its analysis in earlier medical equipment cases (Siemens/ Dräger, Philips/ Agilent and others), attempting to estimate quantitatively the price impact of the elimination of competition between GE and Instrumentarium.

To this end, each major supplier of perioperative monitors (Instrumentarium, GE, Siemens and Philips) was requested to provide electronic files containing precise information about all the tenders in which it took part in each of the fifteen member states over the past five years. For each tender, it had to specify the hospital, the date and the equipment at stake as well as the price offered (and the discount off the price list when possible), which companies were present, which one won the tender and which one was the second best (the “runner-up”).

In addition, the parties were requested to provide the invoices of all the bids they won, the related bidding documents and their price lists in order for the Commission to analyse in greater details how the tenders unroll and to compute the discounts offered by each of the merging parties when they were missing. Hospitals were also contacted to supplement any missing information (e.g. identities of the competitors present in a given tender). This allowed the Commission to compile a database containing information from several thousand tenders across the fifteen Member States.

Based on this database, the Commission conducted two types of empirical analysis. First, it computed summary statistics of the various tenders (statistical analysis), and secondly, it sought to measure to what extent the presence of one of the merging parties in a given tender had an impact on the price offered by the other (econometric analysis).

The statistical analysis of the various tenders brought to the fore useful information on how the various players competed and how they perceived their positioning in the market place. For example, the Commission computed how often the merging parties encountered each other in the tenders. Because the players cannot take part in all tenders but have to select those whose technical specifications make them believe that they have chances to win, the frequency of encounter is a valuable indication as to how close the merging parties are to each other. As a competitive effect may occur only when the merging parties are both present, the frequency of encounters also provided information on the extent of the likely impact of the merger.

The study showed that GE was not the main rival of Instrumentarium in several countries. It also revealed that GE was indeed by far the most frequent runner-up to Instrumentarium in some Member States, such as Germany, France or Spain. In France, for instance, while GE’s market share was below 10% and Instrumentarium’s in the range of 40%-50%, GE was the runner-up to Instrumentarium in more than half of the tenders, and in a much higher proportion than Philips and Siemens. This again pointed toward GE

being more of a constraint on Instrumentarium than its limited market share may have initially suggested.

The Commission, in a second step, conducted an econometric analysis to estimate the likely price impact of the merger. To this end, the Commission sought to compute to what extent the prices offered by one of the merging parties statistically varied depending on the presence of the other bidders and, particularly, the other party to the concentration. Because of the highly differentiated nature of the products, it was not possible to directly measure the price impact. Most tenders concerned various pieces of equipment and without additional data on product characteristics it was not possible to control for the price difference that was solely the result of difference in product characteristics. As an alternative, the Commission used discounts off list price. Discounts were pervasive in this market and allowed comparison across bids. However, even the construction of a discount variable proved difficult due to the lack of reliable information. The Commission succeeded to build a meaningful data set for discounts offered by GE and Draeger in tenders they won in France.

Multivariable regression analysis helped identify the effect of Instrumentarium on GE's discount while controlling for other factors that also impacted on the discount, such as the value of the bid or the presence of other players. The Commission estimated a simple, yet robust econometric model. The dependent variable of this reduced form model was the discount offered for GE monitors. The Commission estimated one regression for the discount offered by GE and a separate regression for the discount offered by Draeger when selling GE monitors. In both cases, the regression results showed that the presence of Instrumentarium had an impact on the discount offered on GE monitors. The discount was 2% and 7% higher when Instrumentarium also participated in the bidding. These results were statistically significant, and provided additional evidence that Instrumentarium was exerting a significant competitive constraint on GE⁴³.

Based on the qualitative and quantitative evidence collected during the investigation, the Commission came to the conclusion that in five Member States the merger would not only lead to the creation of a new entity holding high market shares but would also remove the significant competitive constraint that the two merging firms exerted on each other prior to the operation. Because fringe players played a minor role in the market the merged entity would thus have had the ability and the incentive to raise prices charged to customers in those five countries.

The case highlights both the potential and also the limitations of estimating quantitatively the price impact of mergers in bidding markets. The analysis can be very persuasive and generate robust evidence when appropriate data sets are available. On the other hand, collecting and compiling data sets can be an extremely onerous task both for the

⁴³ In the market for critical care monitors, the Commission used the same type of analysis, but reached the opposite conclusion. Here the data did not show that GE and Instrumentarium were close substitutes or that they exercised a particularly important competitive constraint on each other.

competition authority and market participants. Data quality can be a difficult issue particularly in differentiated product markets because the econometric analysis needs to control for a variety of project-specific variables whose impact on price may be significantly greater than the number and identity of competitors.

4.2. Fixed Effects Regressions: Ryanair/Aer Lingus

Recently, the Commission prohibited the hostile takeover by Ryanair of Aer Lingus. The facts of this case differ from previous airline mergers assessed by the European Commission. This was the first time the Commission had to assess a proposed merger of the two main airlines in a single country, with both operating from the same "home" airport – Dublin. It was also the first time the Commission had to assess a merger of two "low-cost" airlines, operating on a "point-to-point" basis. Furthermore, the number of overlapping routes is unprecedented compared with previous airline cases.

To assess the extent to which the merging parties impose a competitive constrain on each other pre-merger the Commission, inter alia, run a price regression analysis based on a data set combining data submitted separately by the parties and the Dublin Airport Authority

In interpreting the results of a multiple regression analysis, it is important to distinguish between correlation and causality. Two variables are correlated when the events associated with the variables occur more frequently together than one would expect by chance. A correlation between two variables does not imply that one event causes the second to occur. Therefore, in making causal inferences, it is important to avoid spurious correlation. Spurious correlation arises when two variables are closely related but bear no causal relationship because they are both caused by a third, unexamined variable.

Causality cannot be inferred by data analysis alone - rather, one must infer that a causal relationship exists on the basis of a theory that explains the relationship between the two variables. In this case, the theory of harm is that the merger between Ryanair and Aer Lingus may significantly impede effective competition in certain routes by removing important competitive constraints the merging parties exert on each other. The most direct effect of the merger will be the loss of competition between the merging firms, allowing the merged entity to exercise increased market power to the detriment of customers.

The Commission's price regression analysis was designed to test a number of hypotheses delineated ex-ante concerning the extent to which the fares of one party are affected by the other. The Commission relied on a panel-data set obtained by combining price, frequency, and route-specific data provided independently by the merging parties and the Dublin Airport Authority. Both Ryanair and Aer Lingus also submitted their own econometric reports.

All reports followed essentially the same strategy: to determine whether the presence of one of the merging parties on a route would have an impact on the prices of the other. Hence, the variable to be explained is the net average fare in a certain month on a given route and the explanatory variable of interest is one that indicates that a rival firm offered one or more flights in that same month and route. Other variables are added to “control” for other possible systematic influences on fares, which refer to route characteristics that may affect demand or supply on that route.

The Commission explored two econometric methodologies:

- (i) Cross-section regression analysis, which examines differences in prices across a number of affected routes at a point in time.
- (ii) Fixed-effects regression analysis with panel data, which exploits the variation in market structure at individual routes over time.

Cross-section regressions use information on different market structures across routes, controlling for observed route specific factors that affect fares. The primary advantage of this methodology arises where market structure varies substantially across routes and where there are a large number of routes in the data. Ryanair’s expert economists focused essentially on this approach.

The disadvantage of using a cross-section approach is that it may not be possible to control for important but unobserved or unmeasured influences on price that vary from route to route. When important variables affecting price in different routes cannot be observed and are correlated with the explanatory variables included in the regression, the estimated coefficients can be subject to an omitted variable bias.

The Commission could derive no definite conclusions from cross-section regressions in this case given the impossibility to control for a number of unobserved factors that were likely to affect prices and differ across routes, the small number of observations, the sensitivity of the results to the month considered, or the fact that the inclusion of statistically insignificant explanatory variables sometimes affects the coefficients of other variables.

An alternative to making inferences about price effects from cross-sectional comparisons is to exploit the variation in market structure in individual routes over time. This approach uses information on changes in the market structure within a route over time. For example, the entry of Ryanair on a route dominated by Aer Lingus may affect the latter’s price (after controlling for observable changes in other variables such as entry by other rivals).

Effectively the method compares the level of Aer Lingus prices on a route after Ryanair entered with the level before Ryanair entered. This before-and-after comparison is done systematically for all routes where Aer Lingus operates and thereby generates the average

effect of Ryanair's presence on Aer Lingus fares. Aer Lingus' expert economists focused essentially on this approach.

The fixed-effects procedure compares the incumbent's prices before-and-after entry of a rival within the same route. Such a comparison can mitigate the omitted variable bias that affects cross-section regressions because it is more likely that unobservable or non-measurable cost or demand factors affecting fares and varying across routes are not likely to vary over time within a given route (such as the type of destination, the popularity of the route according to purpose of travel, customer awareness, destination airport characteristics, number of alternative airports at destination, safety considerations, total duration of travel, air traffic regulations at country of destination, etc.). Thus, the primary advantage of fixed-effects regressions comes where most unobservable or non-measurable factors affecting price are unlikely to vary much during the sample period.

Fixed-effects regressions are suitable if there is sufficient time series variation in the data to permit precise estimates of the relationship between price and presence of a rival. It turns out that there were many instances of Ryanair's entering or exiting a route already served by Aer Lingus within the period of analysis (five years). In contrast Aer Lingus had entered or exited routes where Ryanair was present in very few instances. A likely explanation is that Aer Lingus was taking the lead in the opening of routes out of Dublin, with Ryanair following. In any event this pattern in the data meant that the fixed effects methodology was primarily suitable to assess the effect of Ryanair's presence or capacity expansion on Aer Lingus' prices.

The results from fixed-effects regressions on Aer Lingus price indicate consistently that Ryanair exerts a competitive constraint on Aer Lingus' prices. In particular following hypothesis set out ex-ante are validated:

- First, depending on the specification, the Ryanair's presence is associated with Aer Lingus charging around 7-8% lower prices when considering city-pairs reflecting the Commission's retained market definition and around 5% lower prices when considering airport-pairs. This effect is economically and statistically significant in all tested regressions. This result is also robust, correcting for the presence of outliers, heteroskedasticity and serial correlation. It is also highly robust to the use of alternative specifications including alternative demand and supply controls. Notably, in practically all cases the control variables in the different regressions have the expected signs and are statistically significant. The explanatory power of the regression is also high with R^2 consistently above 80%.
- Second, comparing the coefficients of Ryanair with that of flag-carriers and non-flag carriers, as well carriers with relative presence at Dublin such as Aer Arann and CityJet, Ryanair's presence or number of frequencies have a much stronger economic impact (at least double) than that of any other type of carrier. In fact, in most cases the regressions indicate that the presence of other carriers has no economic or statistically significant effect on Aer Lingus fares.

- Third, destination-based flag carriers exert only a very limited constraint on Aer Lingus. Destination-based non-flag carriers exert a higher constraint than flag based carriers. However, their constraint is around half or less than the constraint exerted by Ryanair on Aer Lingus retaining the Commission's market definition. Moreover flag carriers, for instance are only present on 8 of the 37 overlap routes upon which Aer Lingus and Ryanair competed in May 2007, and tend to be much smaller than either Ryanair or Aer Lingus where they are present (especially for point-to-point passengers). Thus, contrary to Ryanair's claim, it cannot be expected that the merged entity would be effectively constrained by flag or other non-flag carriers post-merger.
- Fourth, measuring the strength of Ryanair's presence using number of frequencies in the route as a proxy provides further confirmation that Ryanair constrains Aer Lingus. It is possible to examine the price change in overlap market only or across all markets under various assumptions. For example one can focus on the price effect on the last month for which data is available or the price effect on average over the full sample period. Depending on the specification the price effect of the merger implied by the Commission's frequency regressions is around 5-6% (on average over all routes) or 10-12% (if only overlap routes are considered). This adds to the robustness of the results derived from the presence specifications. It is also worth noting that, as expected, Ryanair appears to impose a more significant constraint on Aer Lingus when it serves the same airport.

The Commission points out that the *fixed-effects* regressions with Ryanair's prices as the dependent variable do not allow reaching conclusions with respect to the impact of Aer Lingus on Ryanair prices. This is because there are insufficient instances of Aer Lingus exiting or entering into a route where Ryanair was already present. In other words there is little variation in the presence of Aer Lingus on Ryanair routes. It should be emphasised, however, that this neither validates nor refutes the hypothesis that Aer Lingus exerts a competitive constraint on Ryanair's prices⁴⁴. As a result the *fixed-effects* regression does not provide reliable estimates of the possible impact of Aer Lingus' presence on Ryanair prices. In contrast, there are many instances of Ryanair entering/exiting routes in which Aer Lingus was already present. Hence the *fixed-effects* procedure is very well-suited to assess whether Ryanair's presence is negatively associated with Aer Lingus prices.

The Commission remarks that the effect of Ryanair on Aer Lingus prices is likely to be underestimated. The presence of Ryanair in Dublin exerts a potential competitive constraint on Aer Lingus. On routes out of Dublin where it is the only carrier, it can be expected that Aer Lingus sets prices which are lower than what it would charge if Ryanair had no Dublin base. Since the regression analysis considers only fares' overtime variations within each route and only captures price reductions subsequent to Ryanair's entry, this *potential competition* constraint does not show up in the empirical results.

44 In order to capture more events of Aer Lingus entering, the extensive data set has enabled the Commission to consider a longer time period, starting from April 1997. While in fact Aer Lingus' presence has a significant negative effect on Ryanair's prices in that regression, for a number of reasons – as set out in Annex 4 – the Commission does not give weight to this result.

4.3. Merger Simulation

In a number of cases, the Commission has used specialized econometric techniques to assist it in predicting the effects of the merger. Perhaps the first attempt to rely on econometric evidence was in Volvo/Scania (1999),⁴⁵ where the Commission had requested an independent study to try to predict the ultimate effect on prices of the merger. The Commission noted in the decision that this method could be a valuable supplement in a traditional analysis, in particular, "when the customer base for a product is very fragmented so that reaching a satisfying segment of customers through survey-based methods is difficult." The efforts in this particular case proved ultimately to be of limited success, in that the Commission finally concluded that: "Given the novelty of the approach and the level of disagreement, the Commission will not base its assessment on the results of the study".

The clearance of the Swedish merger between two electricity producers, Sydkraft/Gräninge (2003) was in part based on a simulation of the merger carried out on a model developed by the Danish grid operator Eltra. Although the market shares of the combined entity were relatively modest, the Commission had expressed concerns that in view of the prevailing market conditions, "market power could emerge and result in consumer harm at relatively lower concentration levels than in many other markets".⁴⁶ The simulation showed that the merger was unlikely to result in a price increase; Sydkraft was not sufficiently large before the merger to have an incentive to withhold capacity in order to bring about a price increase, and the acquisition of Gräninge would not significantly alter the situation.

In Philip Morris/Papastratos (2003)⁴⁷ the Commission relied in part on a simulation showing only a minimal price increase after the merger. The decision contains no details as to the exact nature of the model, which was provided by the notifying parties. However, the simulation is cited as merely confirming the Commission's own analysis: the product ranges of the merging parties were essentially complementary, so that it could not be predicted that customers lost through a price rise in one segment would be largely recovered through sales of other products of the merged entity.⁴⁸

In Lagadere/Natexis/VUP (2004) a merger between French publishers, the Commission used an econometric model (so-called nested logit) to predict the likely effect on prices. This technique allowed the Commission to use past data⁴⁹ to identify the customers'

⁴⁵ M.1672, at paras 72-75.

⁴⁶ Sydkraft/Gräninge (2003), M.3268, at para 36. The reasons included highly inelastic demand, very high entry barriers and capacity constraints arising from grid bottlenecks, which reduced the possibilities for competitive responses to the exercise of market power.

⁴⁷ M.3191, at para 32.

⁴⁸ M.3191, at paras 26-30.

⁴⁹ In this case there were 9566 observations.

substitution patterns and to use these estimates to quantify how big a price increase would result from the removal of the competition between the merged publishers.⁵⁰

5. CONCLUSION

Competition economists increasingly recognize the need to get down in the trenches and get their hands dirty digging for the facts. As Sherlock Holmes demanded impatiently in *The Adventure of the Copper Beeches*—"Data! data! data! I can't make bricks without clay!"—so it is with the good economist working in antitrust. In recent years the European Commission has gained confidence and experience in the use of econometric techniques in delineating markets or assessing the competitive effects in merger cases. At the same time the Commission regards such techniques not as decisive but rather as an adequate complement to the more traditional analysis of qualitative evidence.

In line with this evolution, the standards in the generation and interpretation of econometric evidence have risen considerably. An assessment of the relevance and rigor of the economic analyses submitted in a competition policy case requires, *inter alia*, (i) understanding whether the data employed in those analyses is appropriate and the facts which are to be explained are properly established; (ii) assessing whether the underlying assumptions in their economic models are consistent with the institutional features of the industry under scrutiny and with all other relevant facts; (iii) whether those models are well established in the relevant literature; and (iv) whether the empirical approach adopted in order to test one or more hypothesis relevant to the case is appropriate. Furthermore, the conclusions of those analyses should be contrasted with other pieces of evidence (such as, e.g., customer evidence, documentary evidence) in order to determine whether the evidence—factual, documentary or economic—provides a coherent picture or, alternatively, further research is needed prior to reaching a definitive conclusion.

⁵⁰ Although the Commission had found that large-format and pocket books were two separate markets, the model included both types of books. It is thus an illustration of the general argument that such techniques will allow a prediction of the likely effect of a merger without having to define the relevant market.