3. Efficiency gains from mergers

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The purpose of this chapter is to contribute to the analysis of two questions. Should a merger control system take into account efficiency gains from horizontal mergers, and balance these gains against the anti-competitive effects of mergers? If so, how should a system be designed to account for efficiency gains?

There are several reasons why efficiency gains from horizontal mergers are an important issue today. Business conditions are changing rapidly, for example as a result of the internal market, increased global competition, and the deregulation of many industries. The consequent need to adapt the industry structure has generated a wave of mergers in Europe as well as in the rest of the world. The current wave is of historical proportions.

All mergers with a so-called Community dimension must be notified to the Commission and are subsequently reviewed under the Merger Regulation[1]. According to Articles 2(3) of the Regulation, a concentration which "creates or strengthens a dominant position as a result of which effective competition would be significantly impeded" shall be prohibited. Otherwise it shall be allowed. According to Article 2(1)(b), the Commission shall, in making this appraisal, amongst other things take into account "the development of technical and economic progress provided that it is to consumers' advantage and does not form an obstacle to competition". The latter clause has triggered a debate whether the Merger Regulation allows for a so-called efficiency defence. Can important cost savings (or other efficiencies) save an otherwise anti-competitive merger? The Commission has, in policy statements, argued that, "(t)here is no real legal possibility of justifying an efficiency defence under the Merger Regulation. (Commission, 1996)" Many economists, starting with Williamson (1968), have argued that competition authorities should take efficiency gains into account.

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[1] All references to the Merger Regulation in this chapter are to the old Regulation no. 4064/89.

Another reason why it is important to discuss an efficiency defence under the Merger Regulation is the introduction of the concept of joint dominance. According to the Merger Regulation, a merger can only be blocked if it creates or strengthens a dominant position. A firm is dominant if it has a large degree of market power - a monopoly-like situation. In such cases one talks more precisely of single firm dominance. The Commission has widened the concept of dominance to include also joint, or oligopolistic, dominance. The relevance of joint dominance in merger cases was confirmed by the Court in the *Kali+Saltz* decision. This suggests that merger policy has become stricter. Economic theory suggests that cost savings (and other efficiencies) are more likely to dominate the anti-competitive effects of a merger, the lower is concentration. Hence, the introduction of joint dominance makes it more natural to consider efficiencies today.

Recent developments in economics may make an efficiency defence more tractable. For example new computer based simulation techniques can be used as a way to estimate the likely anti-competitive effects of a merger and, at the same time, balance these effects against possible efficiency gains. Such techniques are starting to be used in the USA and in Canada.

Finally, one may note that the treatment of efficiencies in merger control also has been debated in the U.S.A. That discussion gave rise to a revision of the Merger Guidelines to clarify how the U.S. Department of Justice and the Federal Trade Commission treat efficiencies. Before this, several revisions of the Merger Guidelines have occurred that show a gradually more positive attitude towards efficiencies. One can also notice a similar development in the Federal Courts' treatment of efficiencies. In the 1960's the Supreme Court seemed to reject an efficiency defence. In the 1990's lower courts have started to analyse efficiencies in a way similar to the Merger Guidelines.

To help answer the two questions whether E.U. merger control should allow an efficiency defence, and if so, how it should be designed, we start with an extensive review of the relevant economic research, including both theoretical and empirical work. Next, we draw up a "check-list" of relevant dimensions that need to be considered when assessing the possible role of efficiencies. Finally, we compare alternative approaches to include efficiencies in a merger control system, emphasising the central role of informational limitations.

We should emphasise that although the insights provided by economic research are vital inputs for answering the questions, the final choice necessarily involves value judgements. For this reason, this report cannot come to a definite answer to the above two questions. We should also emphasise, already here in the beginning, that various issues addressed in this report are still the subjects of intense academic research. Many of the facts require more detailed analysis.

1. THEORETICAL ANALYSIS

This chapter provides a discussion of the theory that is necessary to obtain a coherent understanding of mergers and the role played by efficiencies. We start from a typology of possible efficiencies that may arise from mergers. The effects from mergers on consumer or total surplus may depend on the type of efficiency. We distinguish between five categories, based on the concept of the production function:

(1)   rationalisation of production, which refers to cost savings from reallocating production across firms, without increasing the joint technological capabilities;

(2)   economies of scale, i.e. savings in average costs associated with an increase in total output;

(3)   technological progress, which may stem from the diffusion of know-how or increased incentives for R&D;

(4)   purchasing economies or savings in factor prices such as intermediate goods or the cost of capital;

(5)   reduction of slack (managerial and X-efficiency).

Next, we review the anti-competitive effects that may arise from mergers, either due to an increased unilateral market power, or due to an increased likelihood of successful collusion.

Finally, in this chapter we discuss both the price effects and total surplus effects arising from mergers, taking into account the role played by efficiencies. We argue that internal efficiencies often need to imply sufficiently large savings in marginal costs for price to decrease. Not all types of efficiencies guarantee that this will be the case. The required *amount* of efficiencies for price to decrease depends on various variables, such as the merging firms' market share and the price elasticity of demand. For total

welfare to increase, all types of internal efficiencies may in principle be considered, although the required amount may depend on which type of efficiency is realised due to the merger. It is important to stress that the precise amount of efficiencies required for price to decrease or total welfare to increase is dependent on the specific assumptions one makes about how firms behave in the market, both before and after the merger. This does not make it possible to present a simple and unique formula, applicable to all mergers.

1.1 Typologies of efficiency gains

Efficiencies from mergers may come in a variety of ways. In order to obtain a clear and systematic understanding of the consumer and welfare effects of mergers, discussed in section 1.2, it is important to make a typology of the various kinds of efficiencies that may be created. Naturally there are many different way in which one may categorise efficiency gains from mergers. Different typologies are useful for the different discussion in this report.

The first typology is based on the concept of the production function. It is extensively used in the literature on productivity measurement.

- Rationalisation,
- Economies of scale,
- Technological progress,
- Purchasing economies,
- Slack.

This typology is useful for the identification of different efficiencies. This typology is described in detail in sub-sections 1.1.1 to 1.1.5 below.

A second distinction that is often made in the context of merger analysis is:

- Real cost-savings,
- Redistributive (or pecuniary) cost-savings.

This distinction is important since typically only real cost-savings are considered in an efficiency defence. Redistributive gains are cost-savings that the firms may achieve for example in the form of lower taxes. However purchasing economies may also be redistributive (see below). Real cost-savings are those savings that correspond

to some savings of productive resources in the economy. Rationalisation, economies of scale, technological progress, and slack reduction are all real cost-savings. Also some purchasing economies are real cost-savings.

A third distinction that is often made in the context of merger analysis is:

- Fixed costs,
- Variable costs.

This distinction is important since savings in variable costs, but not savings in fixed costs, may almost immediately benefit not only the merging firms, but also the consumers (see below). Savings in fixed costs normally come in the form of economies of scale, technological progress, and purchasing economies. Savings in variable costs may come in all five forms.

A fourth distinction that is useful in the context of mergers is:

- Firm level efficiencies,
- Industry level efficiencies.

An example of efficiencies at the level of the industry is cost-savings due to a reallocation of production from the merging firms to their competitors—a common effect of mergers (see below). This distinction is important since it is mainly about the first category that the merging firms have an informational advantage over competition authorities. All the five categories above can occur at both the level of the firm, but also at the level of the industry. Efficiencies at the level of the industry are discussed separately in section 2.3, since they should be considered in a different way by competition authorities.

Finally, one may distinguish between:

- Efficiencies in the relevant market,
- Efficiencies in other markets.

According to some, only the first category can be taken into account in an efficiency defence. At a minimum, including also the second type introduces some additional complications.

1.1.1 Rationalisation

Rationalisation of production refers to the cost savings that may be realised from shifting output from one plant to another, without changing the firms' *joint* production possibilities. As the term indicates, rationalisation of production refers to an optimal allocation of the production levels across the different plants of a firm.

Before the merger, the firms may differ in their marginal cost of production. This may be the case for at least three reasons. First, one of the firms may have a higher amount of physical capital. Second, one firm may have some inherent competitive advantage, for example due to a patent or other superior knowledge. Finally, when marginal cost is increasing in output due to capacity constraints, firms may differ in their marginal costs because they are producing at different output levels.

After the merger, the new company becomes a multi-plant firm, and cost savings can be realised by shifting production from the plants with a high marginal cost to the plants with a lower marginal cost. A firm fully rationalises its production if the marginal costs at all its plants are equalised: in this case it no longer pays to further reallocate production across plants. For example, when cost differences arise from differing capacity constraints, output rationalisation implies that the firm, who is most capacity-constrained, reduces its production in favour of the firm with more excess capacity.

The most drastic case of rationalisation occurs when one firm operates at such a low marginal cost (for all relevant levels of total production) that it is optimal to reallocate all production to that firm. The merger then effectively involves the shutdown of the other, less efficient firm. In this case, the merger also leads to an elimination of the fixed set-up costs that are required to keep a plant operational.[2] Such fixed cost savings are discussed in the next sub-section on economies of scale.

1.1.2 Economies of scale (and scope)

A firm is said to have economies of scale when its average cost falls as output increases. Economies of scope generalise the concept of economies of scale to the case of the multiproduct firm (see 1.1.2.3). Economies of scale and scope are frequently used as an argument to defend a proposed merger. To assess the validity of the

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[2]   But in some cases plant closure may also lead to new irreversible costs.

argument in each case, it is important to understand the sources of economies of scale, and assess whether they cannot be realised otherwise.

Economies of scale, realised through a merger, may be the result of co-ordination of the (formerly separate) firms' investments in physical capital - called long-run economies of scale. Other realisations of economies of scale may, however, come already in the short run (when physical capital is held fixed). Chapter 4 contains a more detailed discussion of economies of scale in mergers.

1.1.2.1 Short-run economies of scale

There are two types of short-run economies of scale that potentially can be realised through a merger, namely the elimination of duplication of indivisible tasks, and a form of rationalisation.

First, indivisibility occurs when it is technically impossible to scale down an input below a certain minimum size, even when the level of output is very small. No matter how small the size of a firm, some minimum expenditure on essential tasks is required to keep the firm operational. These include certain administrative and support routines, such as the purchasing of materials, the billing of customers, personnel service etc. These tasks involve fixed costs, i.e. costs that do not increase as total output increases. Before the merger, all firms wastefully duplicate the fixed costs. After the merger, they may be spread over the larger combined output of the merging firms. The merger then realises scale economies by avoiding a duplication of fixed costs. Note that a spreading of these fixed costs may be feasible both when the firms produce identical and when they produce different products.

Second, short run economies of scale may be realised by a reallocation of production between plants (rationalisation). We categorise such cost-savings as economies of scale rather than as rationalisation, if the reason for the reallocation is that short-run marginal cost are decreasing with higher output.[3]

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[3] Such cost-savings could also be classified as rationalisation. We choose to classify them as economies of scale since they reflect downward sloping marginal costs, which is in line with the ordinary use of the term economies of scale. Moreover, the primary use of the term rationalisation can be found in Farrell and Shapiro (1990). Their stability requirement in effect assumes away the cost-savings that we discuss here, if they are sufficiently large.

1.1.2.2 Long-run economies of scale

Long-run economies of scale occur when a doubling of *all* inputs (including physical capital) leads to more than a doubling of total output. Product-level (or specific) returns to scale are related to the total production of a single product variety. Plant-level returns to scale are related to the total production of all product varieties within a plant. Firm-level returns to scale are related to economies realised by managing many plants within the same firm.

Long-run economies of scale may arise for several reasons. First, when the output of a firm is small, it is usually preferable to invest little, and operate at an inferior technology with a higher marginal cost. As the production of the firm increases, it becomes worthwhile to invest more in automated technologies that yield lower marginal costs. Long-run economies of scale may also arise because of the benefits from specialisation. Each worker can concentrate his or her efforts on certain specific tasks that can be implemented more efficiently. Similarly, the energy requirements for a large machine may be proportionally lower than those of a small machine. Due to certain physical laws, material requirements may also be decreasing in size.[4]

To realise long-run economies of scale through a merger, it is essential that the assets of the partners are combined and integrated. Such a restructuring may not be desirable, in the short run: the plants are already built and it is costly to unbuild them, reallocate capital and achieve the economies of scale. Therefore, in the short run, adjustment costs may impede a full integration of the firms' activities. In contrast, in the long run, it may be less costly to integrate the *future* investment decisions within the newly created firm. Future investments occur for two reasons. First, the firms' current capital depreciates and old plants need renovation. This includes both physical capital and intangible assets such as brand name. Second, new investment opportunities may arise if the size of the market increases.

Economies of scale (Scherer et al., 1975; Panzar, 1989) also apply to a context where the merging firms produce differentiated products. After a merger between firms selling similar product lines, it may be desirable to concentrate the production of the certain products within the same plant, rather than to have each former firm continue

to produce the whole product line within the same plant. Such a specialisation of production allows the plants to reduce down time due to shifting production (run-length economies).

Long-run economies of scale may arise in both production and in research and development. They may also arise in marketing activities. A single brand name may be created to economise on advertising expenditures. The sales forces or the distribution network may be combined (see, for example, Kitching, 1967).

The exploitation of economies of scale through a merger between firms that are producing differentiated products may involve a reduction in product diversity. This potential loss to consumers should also be taken into account when measuring the net benefits from economies of scale

1.1.2.3 Economies of scope

Economies of scope arise when it is advantageous to produce goods that are related in one way or another within the same plant. Economies of scope may for example arise when multi-product production requires a common "public" input. For example, the production of wool and mutton requires the common input sheep; the production of beef and hides requires the common input cows. When economies of scope are present, it may not be desirable to have plants specialise in the production of single products even if there are product-specific economies of scale.

1.1.3 Technological progress

In the analysis of technological progress a distinction is often made between process and product innovations. A process innovation reduces the cost of producing an existing product; a product innovation increases the value (quality) of an existing product.[5] Both types of innovation are essentially equivalent in that they imply an improvement in the firms' joint production possibilities frontier. In the discussion below, we often refer to technological progress as process innovations with

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[4] An often cited example is the "cube-square rule": a doubling in the surface area of a pipe, will increase the volume by a factor of 4.

[5] Tirole (1988, p. 389) uses the same definition for a process innovation. He defines a product innovation somewhat differently as the creation of an entirely new product. He then remarks that product innovation can be viewed as a special case of process innovation: the new product already existed prior to the innovation, and the process innovation reduces the cost of production should that it can be profitably supplied.

corresponding cost savings. However, it should be clear that similar conclusions can be drawn for product innovations and corresponding quality improvements.

1.1.3.1 Diffusion of know-how

Firms may have different technological or administrative capabilities due to different patents, different experiences, a different management or organisation, etc … A merger between firms with different characteristics may then lead to a diffusion of know-how across the participants. This can bring the firms closer to their *joint* production possibilities frontier, without shifting the frontier itself.[6]

First, it may be the case that one of the merging firms has superior know-how in all dimensions. The merger then allows its partner(s) to learn and potentially adopt all skills of the firms with superior know-how. For example, the better management may teach the worse management. Alternatively, the better management may replace the old management and make all decisions by itself. In these examples, the diffusion of know-how goes in one single direction, and the superior firm does not learn.

Second, there may be two-way diffusion of know-how. In this case, both firms can benefit from the merger and improve their technological or administrative capabilities. A two-way diffusion of know-how is possible when firms have complementary skills or own some other complementary assets. For example, the merging firms may own complementary patents, which taken together further improve the production process on the quality of the product. A merger in this instance effectively implements a cross-licensing agreement. Similarly, the management of each firm may have built up different experience or expertise. As another example, consider a relatively young R&D-intensive firm that has developed a superior product but lacks the marketing know-how or a distribution network. A merger with one of the existing competitors, with an established brand name and a solid distribution network, may then ensure a fast diffusion of the new (or improved) product.

Two-way diffusion of know-how may also occur when firms have different capabilities in the production of intermediate outputs. For example, consider two car manufacturers which both produce (or purchase from suppliers) several intermediate outputs such as brakes or gears. One of the firms may be more efficient in producing

brakes (or can buy them cheaper from a supplier), whereas the other firms may be more efficient in producing (or purchasing) gears. Specialisation then leads to a reduction in costs, below either of the firms' costs before the merger.[7]

As a final example of two-way diffusion of know-how, consider an industry in which there is learning by doing. Learning by doing means that the firms' average costs are declining in their cumulative (past) output (as a measure of experience). It is sometimes referred to as "dynamic economies of scale". A merger may facilitate learning by doing *spill-overs*, allowing firms to better learn from each other's experience.

1.1.3.2 Incentives for research and development

An important activity of many firms involved in mergers is research and development (R&D), in either cost-reducing production processes or in product improvement or in the development of new products. As discussed above, the integration of investment and R&D activities after the merger may sometimes create significant economies of scale. In addition, a merger may alter the *incentives* for R&D expenditures. R&D decisions are frequently taken strategically, i.e. dependent on the actions of competing firms. It is often argued that the presence of too much competition destroys the incentives to spend money on R&D. The most popular argument is that the outcome of R&D is highly non-proprietary, due to imitation or information spill-overs of the R&D results (d'Aspremont and Jacquemin, 1989). If this is indeed important, a merger could help to internalise the benefits from R&D among the participating firms, thereby creating an increased incentive for R&D.

Even in the absence of R&D spill-overs the intensity of competition influences incentives for R&D. The industrial economics literature has addressed the question whether a large dominating firm still has sufficient incentives to spend money on R&D, compared to its smaller rivals. The answer depends on the expected payoffs from R&D (assuming no spill-overs). Consider first the case in which the outcome of R&D involves little risk, so that R&D looks much like traditional investment. In this case, a

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6   Another way to describe the same thing is to say that the inferior firm's production frontier has expanded.

7   We classify this as technological progress and not as rationalisation. First, the cost-savings correspond to an expansion of the firms' joint production possibility frontier. Second, the cost

dominating firm would have greater incentives to invest in R&D, so as to retain its competitive advantage and associated monopoly rents. In contrast, if R&D are very risky, then the dominating firm cannot guarantee success even for disproportionately large amounts spent on R&D. As a result, the large firm would rather "rest on its laurels", enjoy the current monopoly rents and accept the risk of being leapfrogged.[8]

1.1.4 Purchasing economies

Cost savings may also be involved in the merger because of the presence of imperfectly competitive factor markets. Small firms often need to purchase their inputs such as materials and energy at prices above marginal costs. When the firms merge, their bargaining power may increase and more pressure can be put on upstream input suppliers to cut their prices and obtain quantity discounts. In the automobile industry, for example, manufacturers sometimes form alliances to purchase their components in larger amounts to increase their discounts. Similarly, significant advertising discounts may be obtained when large contracts can be made. To assess the social effects from increased bargaining power towards suppliers, it is important to know the degree of power at the supplier side. If there is little power on the supplier side, the increased bargaining power of the merging firm may be socially harmful. If, however, the increased bargaining power forms a form of countervailing power to an already strong supply side, then the private benefits from the merging firm may coincide with the social benefits. Unfortunately, economic theory has not yet analysed these issues in detail.[9]

Note that mergers may also create discounts when there is no increase in bargaining power (i.e. when the upstream supplier would retain all the bargaining power to set prices). This happens when suppliers offer two-part tariffs, consisting of a fixed fee, and a price per unit (or some other non-linear pricing schemes). Such tariffs are used to price-discriminate between low and high users. When firms merge, they

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saving is achieved through reallocation of production of *intermediary* as opposed to final products.

[8] The first effect has been called the "efficiency effect" in the literature, referring to the fact that a monopoly enjoys higher profits than do two duopolists jointly (see e.g. Gilbert and Newberry, 1982, 1984). The second effect has been called the "replacement effect" (Arrow, 1962). Reinganum (1983) and Tirole (1988) analyse the role of uncertainty in the R&D outcome to assess the relative importance of both effects.

become high users, and thereby can spread the fixed fee and obtain a lower average price for their supplies.

A merger may also lead to a lower cost of capital since capital markets do not function perfectly. For a variety of reasons, such as asymmetric information about risk and expected return, firms cannot always borrow at a competitive interest rate. Especially small and expanding firms often face stringent liquidity constraints, while large corporations usually have better access to the outside capital markets, and big firms in declining industries may even generate "excess" liquidity. A small firm that joins a large corporation, or is being bought by a firm with limited possibilities for internal expansion obtains new possibilities in raising capital.

1.1.5 Slack

Large public corporations are characterised by a separation of ownership and control. This creates problems of asymmetric information between the shareholders of the firm and the management to whom control is delegated. A failure by the management to maximise the profits of the firm leads to internal inefficiency, sometimes called X-inefficiency.[10] Why may the goals of management diverge from profit maximisation, despite the fact that they are often given profit maximising incentives through profit sharing, stock option plans, etc…? Other interests of management may be the personal ambitions to obtain power, become the leader of a big or growing company; or not to change a chosen strategy and thereby admitting old mistakes; or to avoid to fire excess personnel. These goals conflict with the shareholders' goals. The shareholders can exercise some control over the management through the board of directors. However, the management is usually much better informed about its projects, and the board may have only limited possibility to challenge the management's decisions. To collect all the necessary information is not necessarily profitable. After all, the whole idea to delegate power to the management is to avoid these information costs.

The firm's internal efficiency is partly determined by the management (administrative) techniques, such as incentives systems, used to mitigate the problems caused by the separation of ownership and control. We view such techniques as

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[9] For preliminary discussions of the role of countervailing power, see Galbraith (1952), von Ungern-Sternberg (1995), and Snyder (1996).

defining the firm's production possibility frontier, and hence improvements in such techniques as technological progress. A merger may lead to improvements in such techniques (for example if one firm can learn them from the other). Such gains, we classify as technological progress, and not slack reduction.

However, the firm's internal efficiency is also determined by other factors, and these other factors may be affected as a result of a merger. One commonly mentioned example is that mergers are an important part of the disciplining power of the capital market (discussed in sub-section 1.1.5.1). Another example, pointing in the opposite direction, is that a horizontal merger reduces competition in the product market and hence the disciplining power of the product market on firm efficiency (discussed in sub-section 1.1.5.2). A third example is that a merger may increase the possibilities for the merged entity to use relative performance evaluations between the formerly separately owned plants.[11] If that would happen, slack would be reduced as a result of the merger.

1.1.5.1 The market for corporate control

A slack makes a firm undervalued and lowers the firm's stock price. This may induce another company to buy the firm, re-organise and bring the firm back to profit maximising behaviour. Actually, Manne (1965) and Marris (1964) argue that the mere threat of a take-over can be sufficient to discipline the current management, despite the presence of asymmetric information between shareholders and management.

The threat of corporate take-overs may then serve as a disciplining device to the management. Yet management is usually not punished after a take-over; they often even obtain large compensations ("golden parachutes"). The punishment mainly lies in the loss of the enjoyed managerial rents, including prestige or on-the-job consumption, such as private jets and excessive representation. See Scharfstein (1988) for a detailed analysis. Provided there is a sufficiently high punishment threat to management involved, a well-functioning market for corporate control could then ensure that managerial inefficiencies could not be long lived.

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[10]   The term X-efficiency, introduced by Leibenstein (1966), was originally used in a broader sense than just to describe issues related to the separation of ownership and control.

[11]   For a discussion of relative performance evaluations, see Holmström (1982).

The disciplinary power of take-overs is, however, limited for several reasons. First, there is a free-rider problem involved in disciplining the management, as pointed out by Grossman and Hart (1980). A raider needs to collect costly information to identify managerial inefficiencies. The raider can then make a profit only if the tender price of the shares (at which he buys) is lower than the post-raid price. However, each single current shareholder may not be willing to sell at a tender price, in anticipation of a higher stock price after the raid. [12] One solution to this free rider problem is dilution, which allows a majority shareholder (the raider) to sell part of the firm to another company he owns at terms that are disadvantageous to minority shareholders. Shleifer and Vishny (1986) point out that a raid may be successful if it is done by a large existing shareholder, who than at least enjoys an increase in the value of its own shares (the other shareholders would then benefit more, of course).

A second limit to take-overs arises because of possible actions by the existing management in response to take-over bids. For example, poison pills are sometimes used as a defence. These are preferred stock rights that may be used in the event of a tender. Scherer (1980, cited in Holmström and Tirole, 1989) also questioned the strength of the disciplining power of take-overs. Take-overs are very costly so that they may be used only in cases of severe mismanagement.

The theory of the disciplining role of take-over threats is also problematic in that it is difficult to test empirically. Studies of actual take-overs cannot provide sufficient information, since the theory is about the disciplining *threat*, which is difficult to measure as long as it is not realised.

As discussed by Manne (1965), the theory of the disciplining role of take-over threats is potentially important for the design of merger control. Unfortunately, to our knowledge, there has been little or no research on this topic. Nevertheless, a few general remarks can be made. By making take-overs more difficult, competition policy may reduce the disciplining role of the take-over threat. Presumably, the firm's closest competitors form the most effective take-over threat, since they are likely to possess the best information about mismanagement. Without the allowance of an efficiency defence, such disciplinary mergers may not be carried out. As a compromise, one may argue that a take-over should be temporarily allowed, to replace current management;

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[12]   However, see Bagnoli and Lipman (1988), for a critique to the Grossman and Hart argument.

after the re-organisation the target should be sold again as soon as possible. The problem with such as compromise is however that a raider would be strengthening the position of its own competitors, so that the raid would not be carried out in the first place. Hence, if a disciplinary threat of mergers mainly comes from competing firms, there may be a real trade-off between efficiency gains and anti-competitive effects.

1.1.5.2 Product market competition and the internal efficiency of firms

When product market competition is soft, management and employees exert low effort and production costs are high. Moreover, the low efforts and the high costs are too low and too high respectively, from a social welfare point of view. These ideas are widespread among economists as well as policy makers. Actually, these ideas motivate policies to promote competition such as deregulation and trade liberalisation. For example, the European Commission (1988) argued that "...the new competitive pressures brought about by the completion of the internal market can be expected to ...produce appreciable gains in internal efficiency...[which will] constitute much of what can be called the dynamic effects of the internal market..." According to Scherer and Ross (1990) the empirical evidence is fragmentary but points in the same general direction: x-efficiency is more apt to be low when competitive pressures are strong than when firms enjoy insulated market positions. Moreover, these X-inefficiencies are at least as large as the welfare losses from resource misallocation.

There is a small literature that has analysed the different linkages between product market competition and firm efficiency. Some studies focus on *financial* linkages between competition and firm efficiency. Grossman and Hart (1982) argue that if there exists a bankruptcy-risk, and a receiver who is able to recover all funds that are not invested, leaving the manager with no perquisites in case of bankruptcy, the manager invests more to reduce the risk of bankruptcy. Any changes in product market competition that affect the risk of bankruptcy also affect managerial incentives. Schmidt (1997) makes this intuition more precise. In his model, increased competition has two effects on managerial incentives: it increases the probability of liquidation, which increases managerial effort, but it also reduces the firm's profits, which may make it less attractive to induce high effort. Stennek (forthcoming) argues that limited liability may serve as a disciplining device on the internal efficiency of a firm, and the

tougher the product market competition, the higher the disciplining power.[13] However, even if policies that promote competition enhance X-efficiency, the social gain may be outweighed by a less efficient allocation of risk. Other studies focus on *informational* linkages between competition and firm efficiency. Holmström (1982) and Nalebuff and Stiglitz (1983) argue that cost shocks normally should be positively correlated between competitors. Then, by using relative performance evaluations, the moral hazard problem is mitigated within each firm. However, even if more firms increases the amount of available information and hence increases the overall efficiency of the firms, the effect on effort is ambiguous.[14] Hermalin (1992) focus on *wealth* linkages between competition and firm efficiency. He argues that managers often have substantial bargaining power in negotiations over their employment contracts. Since increased competition decreases the "pie" over which the principal and agent bargain, increased competition also reduces the manager's wealth. If "shirking" is a normal good, then competition reduces shirking. Finally, some papers focus on *output and strategic linkages* between competition and firm efficiency. Martin (1993) and Horn, Lang, and Lundgren (1994, 1995) argued that a reduction in marginal cost saves more money for larger firms. Since the size of firms decreases with competition, managers exert more effort into cost-reduction under soft competition - an output effect. Horn, Lang, and Lundgren (1994) also demonstrate a strategic effect when the compensation scheme is public information.[15]

Perhaps surprisingly, the emerging picture from these studies is that the effect of competition on internal efficiency may be both positive and negative. Moreover, even in the cases the effect is positive, the welfare consequences may be negative. The picture is rather complex. Unfortunately, none of the studies explicitly examines the effect of merger on X-efficiency. The reason for the change in competition in these studies is rather lowered entry barriers or trade liberalisation. Hence, it is not clear to what extent the studied linkages between competition and X-efficiency also are

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[13]   If competition is tough, firm revenues are low. Hence, in case costs are firms are forced to pay low wages (including fringe benefits, courses that increase human capital, and so on). But then, to guarantee that employees receive their expected utility, the firms must pay high wages in case costs are low. Hence, in the presence of limited liability, if competition is tough, the market forces firms to give their employees an incentive contract (wages contingent on cost realisation).

[14]   In Hart (1983) and Scharfstein (1988) the information is transmitted via the market price.

[15]   Also Brander and Spencer (1989) establishes the existence of a negative relation between competition and managerial incentives.

relevant in merger analysis. In our view, the issue of whether and how mergers, trough its effect on competition in the product market, affect the X-efficiency of firms is still an open question.

1.2 Anti-competitive effects from merger

The prime reason why competition policy authorities are concerned with horizontal mergers is that they reduce competition, which may have many unwanted repercussions in the affected markets. The most well-known effect of a reduction of competition is that prices may increase. This effect will be discussed in detail below. Another effect is that a reduction of competition may lead to X-inefficiency (or slack) in the firms (see sub-section 1.1.5 above). Reduced competition may also reduce firms' incentives to provide product diversity and to innovate (see sub-section 1.1.3.2 above). Finally we should mention an aspect which is often mentioned but not yet studied in any detail. Firms' managers have only limited cognition (or bounded rationality). As an unavoidable consequence, many of their decisions are based on their beliefs and prejudices, and not on facts and reasoning. As a result of these individual imperfections, competition in the market place has an important role to fill as a selection device. If competition is intense, only those firms survive and expand that are run by managers who (by coincidence) happen to be equipped with the most accurate beliefs and prejudices. These are the firms that produce the product varieties that consumers want at a low cost. In contrast, if competition is soft, also high-cost firms that produce inferior product varieties may survive.

As already argued, the most well-known effect of a reduction of competition is that prices may increase. There are two possible reasons to be concerned with price increases. First, there is the obvious fact that a price increase implies a transfer of wealth from consumers to producers. This is a distributional consideration. Second, an increase in the price of a product above its marginal cost creates (or strengthens) an allocative inefficiency, also called the dead-weight loss. Indeed, whenever the price of a product exceeds its marginal cost, it would be socially desirable to increase production. The social value of increasing production by one unit equals the current price minus the marginal cost (the difference between what consumers are willing to pay for an additional unit, and what this additional unit costs to producers).

Competition authorities in most countries have been primarily concerned with the distributional effects of price increases. Economists, in contrast, tend to argue that one should focus on total welfare, and therefore focus on the allocative inefficiency (or dead-weight loss) caused by the merger. Whatever the policy concern behind price increases, a proper assessment of the competitive effects from mergers requires a good understanding of the nature of competitive interaction in the industry.

Generally speaking, oligopoly theory confirms the common intuition that prices increase as the number of firms is reduced. Abstracting from cost reductions, the fear for price increases following merger may thus be justified. Two reasons for price increases may be distinguished. First, a merger between two or more firms may increase the firms' unilateral market power. Before the merger, the firms compete and do not take into account the effect of their quantity or price decisions on the profits of their competitors. After the merger, the firms maximise their joint profits, and thereby take into account the detrimental effect of quantity increases or price cuts on the market share of each others' products.

Second, a merger may shift the nature of conduct from competitive to collusive behaviour, or facilitate collusion at a higher price level. As the number of firms decreases, it may become easier to sustain implicit cartel agreements, for example because it becomes easier to monitor cheating. When a shift in conduct takes place, the merger increases the joint market power of the firms in the industry.

The risk for price increases following mergers may be limited for several reasons. The presence of actual competitors producing similar products is an obvious first constraint. Second, the possibility of entry in the long run may effectively constrain the firms' willingness to raise prices. Third, especially in intermediate goods markets, strong buyers may exercise countervailing bargaining power that may limit the merging firms' potential to raise price. Finally, it may be the case that one of the merging firms is failing[16], perhaps due to a drop in demand for its product. In the absence of a merger

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[16] This relates to the failing firm defence, stating that a horizontal merger between two firms should not be considered anti-competitive, if the relevant alternative to the merger is that one of the firms is declared bankrupt and shut down. This defence has been used in several countries including the US and in the European Union. In the EU the additional condition is added that that the market share of the failing firm would inevitably accrue to the acquiring firm even without the merger. For discussions of the failing firm doctrine, see Kwoka and Warren-Boulton (1986), Shughart and Tollison (1985), Saloner (1987), and Persson (1997a,b).

such as firm would eventually have to leave the market, so that market power would increase irrespective of the merger taking place.

In the following discussion, we will assume that entry is difficult, and that none of the firms is failing. Efficiency considerations are usually only made when these assumptions hold true. We will also assume that buyers take prices as given, and hence do not exercise countervailing power. This assumption is an unfortunate consequence of the fact that economic theory is lagging behind. The theory of oligopoly that is used to assess the competitive effects of mergers has generally assumed that one side of the market (typically the consumer side) is price taking, and that only the other side of the market exercises market power.

1.3 Welfare Effects of Mergers and the Role of Efficiencies

The previous section sketched some general considerations on the competitive effects of mergers. This section goes into more detail, and in particular examines the role of efficiencies. In order to assess the overall effects of mergers it is necessary to first make explicit the policy goals of merger regulation. In the policy debate several objectives are frequently mentioned.

- Consumer surplus. A first objective upon which merger analysis may be based is the protection of consumer interests. If this is the case, the central focus of merger analysis is on the competitive, or price effects, of mergers

- Total surplus. Another objective may be to further both consumer and producer interests. Total surplus may operationally be defined as the sum of consumer and producer surplus. More generally, one may give different weights to consumer and producer surplus.

- Other objectives. These include the promotion of European integration, employment, regional balance, viability of small firms, and competitiveness of national firms on international markets. The concern with the preservation of employment has often been a political concern in proposed mergers. In principle, employment considerations should be taken into account in a full cost-benefit analysis of mergers. In practice, a merger policy designed to preserve old production structure is presumably not the

best way to deal with the employment objective in the long run. See for example Jenny (1997) and Crampton for more on the employment objective.

In the analysis below we focus on the first two policy goals. This makes it natural to split our analysis into two distinct parts. The first part analyses the price effects of mergers. Of particular interest is the role played by efficiencies. Is the relationship between efficiency gains and consumer interests necessarily a trade-off? Or are there circumstances in which efficiency gains also benefit consumers? To answer these questions, the typology of efficiency gains provided above will prove to be very useful. Depending on the specific type of efficiency, a merger may sometimes lower prices, to the benefit of consumers. To assess the price effects of a merger, it is therefore crucial to identify the specific types of efficiencies that are involved, and, less obviously, to quantify the magnitude of these efficiencies.

The second part analyses the total welfare effects of mergers. To focus ideas, we assume in this part that the efficiency gains are insufficient to ensure price reductions (pro-competitive effects). We then follow a trade-off approach in which the possible efficiency gains need to be weighted against anti-competitive effects from the merger. Once again, the typology of efficiency gains proves useful to assess the trade-offs involved.

1.3.1 Price effects of horizontal mergers

This section considers the price effects of horizontal mergers in the presence (or absence) of cost savings. In practice horizontal mergers may also generate product (quality) improvements. In this case, consumers may benefit from a merger even without price decreases, provided that quality increases sufficiently. The discussion in this section may thus be rephrased in terms of "quality-adjusted" price effects of horizontal mergers (e.g. Rosen, 1974). The spirit of the various results will therefore also apply to mergers with product (quality) improvements.

Since horizontal mergers reduce the number of competing firms in the industry, the common view is that mergers tend to increase price. However, to obtain a thorough understanding into the price effects of mergers, it is necessary to examine this common view under various modes of competition and alternative types of efficiency.

First, consider a simple industry in which all firms have identical and constant unit costs. Consider a merger with no efficiencies gains. In this case, most theories of oligopoly imply that the price will increase.[17] The only exceptions are if firms have a "perfect" cartel before the merger, if one firm is failing, or if the merger triggers immediate entry. In these cases, the price would be unaffected by the merger. What, then, is the role played by internal efficiencies? To which extent can they ensure that price decreases will take place after merger?

1.3.1.1 Non-collusion theories

Farrell and Shapiro (1990) consider a Cournot model, in which firms compete by setting quantities. To simplify, they assume that all firms produce the same homogeneous good. In this set-up they analyse the nature and the magnitude of internal efficiencies that are required for a merger to reduce price and increase output to the benefit of consumers. From their analysis it is possible to draw the following conclusions:

- For price to decrease after a merger, the merged firm must realise a *substantially* lower marginal cost than did either of its constituent firms before the merger. Farrell and Shapiro (1990) provide a more precise formula for the required reduction in marginal costs.

- If the internal efficiencies only consist of output rationalisation or fixed cost savings, then there will be a price increase after the merger.[18]

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[17]   It is straightforward to verify that price will indeed increase under these circumstances in a Cournot model. In models with tacit collusion price will either increase, or remain constant if full collusion already existed. Under Bertrand competition with homogeneous goods, price will either remain constant or increase if it concerns a shift to monopoly. Finally, under Bertrand competition with differentiated products, the analysis by Davidson and Deneckere (1985) shows that prices increase after a merger, at least in their linear demand model with symmetric competition. A similar observation is made for the logit demand model by Froeb and Werden (1994). See Levy and Reitzes (1992) for a model of localised competition to study the price effects of mergers.

[18]   Given that savings in fixed cost do not affect marginal cost, it is obvious that they cannot be claimed to reduce prices. The result that output rationalisation cannot reduce prices is less obvious. A rationalisation of output typically implies a reallocation from the high cost plant to the low cost plant, which (under rising marginal costs) reduces the marginal cost of the high cost plant, while increasing the marginal cost of the low plant (except in extreme cases where rationalisation involves the shut down of one of the merging firms' plant). Apparently, the net effect of these changes according to Farrell and Shapiro's proposition is to always increase price under Cournot competition.

Rationalisation, but not fixed cost savings, may combined with other cost savings lead to lower prices.

Given the negative result on rationalisation and fixed cost savings, one may wonder which type of efficiencies may be responsible for price reductions. The typology of efficiency gains described in section 1.1 provides an answer. The following types of efficiencies may ensure price reductions after mergers, at least provided that they are "sufficiently large":

(1) long-run economies of scale, and product-specific economies of scale

(2) technological progress, either achieved by a transfer of know-how, or by increased incentives for R&D

(3) purchasing economies.

All these efficiencies have in common that they may lead to a (long term) reduction in the marginal costs below those of the formerly separate firms. The question is of course how large the reduction in marginal costs is required to be. Interestingly, Farrell and Shapiro show that the required reductions in marginal cost depend on relatively easy to observe variables, i.e. the firms' pre-merger market shares and the elasticity of demand. We return to this question in more detail in Part 5, where we discuss a framework for merger analysis, including operational criteria for determining the likelihood that mergers will not increase prices.

Farrell's and Shapiro's analysis, as most static theories of oligopolies, stresses the importance of marginal costs rather than fixed costs in reducing prices. In a dynamic setting, when new entry may occur, it may be possible that also fixed cost savings have an impact on prices. At this point, there has however been little theoretical work on this issue.

The analysis of Farrell and Shapiro establishes general results for the Cournot model.[19] Some industries are however better described by the Bertrand model, in which firms compete by setting prices rather than quantities. Does Farrell's and Shapiro's main result generalise to this alternative setting? In particular, can a price reduction after a merger only be achieved through a significant reduction in the

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[19] Brueckner and Spiller (1994) extend Farrell and Shaprio's model to analyze airline networks. They consider the role of higher prices under competition on other routes, and the role of scale economies. They show that consumer may benefit more easily in this setting.

marginal cost below the pre-merger level of either participating firm? General results cannot be easily obtained since the degree of price competition depends on the nature of product differentiation.[20] Nevertheless, the results by Werden and Froeb (1994) teach us some interesting results for an industry with symmetric product differentiation. They assume that a unit price increase by one firm increases the market share of all competitors by the same percentage amount.[21] Werden and Froeb demonstrate the following result:

- If there are no internal efficiencies generated by the merger, except for fixed cost savings or output rationalisation, then the prices of all products in the industry will increase after the merger; the magnitudes of the price increases are dependent on the market share of the different products.[22]

Since products are differentiated, each product may have a different price. Therefore, the effects of a merger on prices are more involved. Werden and Froeb find the following results on the magnitudes of price changes for the various products. First, the prices of the merging firms' products (weighted by their sales) increase by more than any of the competing firms' prices. Especially the price of the small firm's product involved in the merger increases. Second, competing firms with a large market share (for example due to a relatively low marginal cost) will increase price by more than competing firms with a small market share. Moreover, a similar picture seems to emerge as in the general Cournot model considered by Farrell and Shapiro: significant savings in marginal costs, below the lowest marginal cost of either partner involved in the merger, are required for prices to drop after the merger.

Stennek (1997) modifies the assumptions of the Cournot model in a different way, namely by introducing incomplete information between firms about each others' marginal costs. He shows that, under these conditions, the market is inefficient (in

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[20] If goods are homogeneous, the Bertrand model predict a perfectly competitive price – equal to marginal cost – even if there are only two firms. The intuition for this is that for any price exceeding marginal cost, a firm would have an incentive to undercut the rival's price and conquer the whole market. Because of this result, the intensity of price competition is usually modelled by allowing the goods to be differentiated rather than homogeneous.

[21] More specifically, they adopt a logit model of product differentiation, see for example Anderson, de Palma and Thisse (1991).

[22] Werden and Froeb demonstrate their result assuming constant (though possibly different) marginal costs. Note that the incentives for output rationalisation are reduced under product

particular: more inefficient than under symmetric information) in short-term allocation of production between firms. As a result, a merger may increase efficiency due to the pooling of information. Such information synergies may be large enough for price to fall and consumers to benefit from the merger. See also Gal-Or (1988).

1.3.1.2 Collusion theories

Firms may, under certain circumstances, sustain a cartel-like agreement also absent the opportunity to write legally binding contracts.[23] A pre-condition is that the firms are able to detect and punish any firm under-cutting the agreed upon price, without the help of the legal system. Firm organised punishment may, for example, take the form of a price war that is limited in time. Economic models of collusion (notably the super-game literature) attempt to delineate the exact conditions under which such cartel-like agreements can be sustained by the firms. These models may also allow us to assess whether mergers affect the degree of joint market power in the industry.

A first approach to analyse the role of mergers for collusion assumes that there is initially no collusion, and asks whether and under which circumstances collusion is likely to be facilitated as a result of the merger. Recent theories of collusive behaviour predict that there exists a positive relationship between market concentration and the likelihood of collusion. Formal and informal contributions by Stigler (1964), Friedman (1971), Davidson and Deneckere (1984), Oliner (1982), among others, indicate that more concentrated market structures facilitate collusion for a variety of reasons. Increased concentration implies reduced profits from cheating by "stealing" competitors' market shares; increased possibilities to detect cheating; and less co-ordination problems. Compte, Jenny and Rey (1998) emphasise the role of capacity constraints for the sustainability of collusion. A firm's capacity constraint determines how attractive it is for the firm to under-cut the collusive price. The capacity constraint also determines how easy it is to flood the market to punish other firms that deviate. Compte, Jenny and Rey show how merger-induced asymmetries in capacity may affect the sustainability of collusion.

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differentiation, since it implies a change in product diversity. Moreover, the welfare analysis is complicated by any change in product variety.

[23]   It is not clear exactly how one should interpret the term agreement. Some people would argue that firms actually need to meet and discuss the arrangements in order for collusion to be effective. Others argue that it may suffice that firms are forward-looking and recognise their mutual long term interdependence for them to start collusion.

Economic models of collusion have far less predictive power than the non-collusive Bertrand and Cournot models, as discussed for example also by Hay and Werden (1993). The lack of predictive power is almost inevitable, since the mere fact that one collusive outcome is sustainable implies that a variety of other collusive outcomes are sustainable as well. The problem thus is to predict on which specific collusive arrangement, if any, firms would co-ordinate. If one is willing to make some more specific assumptions on which collusive arrangement firms will co-ordinate, one can obtain stronger predictions about the effects of mergers in collusion models. Following this approach, it has been demonstrated that – perhaps surprisingly – the cost savings requirements for mergers to reduce price are smaller if firms collude rather than compete. The intuition behind this result is that firms do not compete anyway before the merger and succeed in (partial) collusion already before the merger. Furthermore, the existing collusion before the merger may create particular inefficiencies that are eliminated after the merger.

To explain the nature of these existing inefficiencies, consider first Schmalensee (1987) and Harrington's (1991) analyses. They study fully collusive regimes based on models of (successful) bargaining.[24] To illustrate, assume there are two firms, one with a low (constant) marginal cost, and another with at a high (constant) marginal cost. In a fully collusive agreement firms will bargain to allocate production such that the price lies in between two hypothetical monopoly prices: the price that the low cost firm would choose if he were a monopoly, and the – higher – price that the high cost firm would choose if he were a monopoly.[25] Now consider a merger between the two firms in such a fully collusive industry. A merger would simply rationalise production by transferring all production from the high cost to the low cost plant. As a consequence, the price drops to the lower monopoly price. Therefore, under full collusion a merger to monopoly reduces price even without any efficiencies other than output rationalisation.

One may argue that this reasoning assumes that firms can enforce a perfect cartel before the merger. Yet Verboven (1995) shows that this result generalises to industries

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[24] A fully collusive regime is an output allocation on the firms' Pareto-frontier. Schmalensee considers this frontier by ignoring incentive constraints that ensure the agreement is sustainable (no cheating). Harrington does take into account the firms' incentives to cheat, but focuses on cases were the incentive constraints are not binding.

[25] This assumes that side payments are not feasible.

in which – more plausibly – only partial collusion can be sustained before the merger, i.e. a price above the Cournot level but below the optimal cartel allocation. In his model, the collusive outcome is determined by the sustainability constraints ensuring that no firm would defect, independent of the exact bargaining process. Verboven also shows that the condition for price to decrease is that the market share of the merging firms is sufficiently small. Furthermore, as the degree of sustainable collusion increases the tolerated market share of the merging firms also increases.

1.3.1.3 Conclusion

The above discussion shows that there are many different modes of (price) competition, and accordingly, many different models of (price) competition. Actually, any description of competition, including ours, is bound to be stylised. Just to mention one example, the mode of competition is much affected by the exact information that the firms have about themselves, about their competitors, and about their market. The effect of merger on price has been studied for some such cases, but not for all of them. Another, but related, problem is that some aspects of competition have hardly been begun to be analysed in economic theory. (That is, there are still too few models of competition!) One example is that almost all economic models of competition are based on the assumption that the firms' managers are fully rational, while they in reality only are boundedly so.

This multiplicity of modes and models of competition creates a problem for policy design. Should policy be based on only one of the models? If so, which one? Or, are there ways in which policy can be made more flexible? The ideal choice, of course, would be if competition authorities, in each individual merger case, apply that model which conforms best to the actual mode of competition. In our policy discussion in Part 5, we will describe some methods that can be used that are based on explicit models of competition. We also describe simulation analysis, a flexible technique that may be tailored to fit the situation at hand even better. However, these methods presume that the competition authority is rather well informed about the mode of competition in the market that they investigate. If that is not the case, we suggest that the authority may use an approach that is based on a worst-case scenario. Hereby, the authority may combine flexibility with limited information. We also suggest that if the firms, that presumably are more informed about the details of the competitive situation,

are not satisfied with such an analysis, and can provide a more well-tailored (and verifiable) analysis, then the agency may use that instead.

1.3.2 Total surplus

Most economists take the view that competition policy should not be designed solely to protect the interests of consumers. A common policy goal formulated by economists is the maximisation of "total surplus", the sum of consumer surplus and producer surplus. Under this policy goal, transfers from consumers to producers due to price increases are not considered as a problem. However, increased prices yield an allocative inefficiency, i.e. a dead-weight loss due to sub-optimal production and consumption.

1.3.2.1 Williamsonian merger analysis

Perhaps the most influential contribution which advocated the total welfare approach in merger analysis is by Williamson (1968). Williamson proposed to compare the dead-weight losses due to price increases after merger with the internal efficiencies that are generated. Williamson concluded that cost savings need not be very high to compensate for dead-weight losses induced by price increases. We now illustrate Williamson's analysis in Figure 1. We will show that the "trade-off" framework is useful, though the conclusion that only small cost savings are required is not general, since this depends on how intense one assumes competition is before and after the merger. This conclusion is similar in spirit to the one obtained when discussing the price effects of mergers. The degree of competition, both before and after merger, are essential in examining the price effects of mergers.

FIGURE 1. WILLIAMSONIAN MERGER ANALYSIS
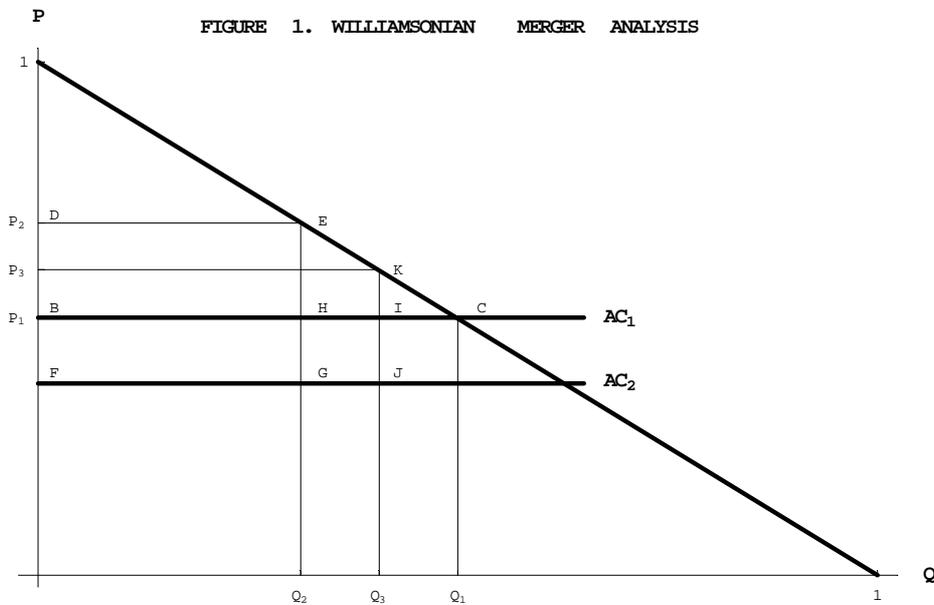
Consider a homogeneous goods industry where unit costs are constant and equal to AC_1 before the merger, and drop to AC_2 after the merger, as illustrated in Figure 1. Consider three alternative scenario's on how behaviour changes due to the merger:

(1) From perfect competition to monopoly

This is the most simple case to analyse. Total welfare before the merger coincides with total consumer surplus at the competitive price P1, indicated by the triangle ABC. At the competitive price, there is no producer surplus. After the merger, unit costs drop and the monopoly price P_2 is charged. Total welfare is now the sum of consumer surplus, ADE, and producer surplus, DEFG. As a result, the *change* in welfare due to merger is the difference between the rectangle, BHFG, and the triangle, EHC. Intuitively, the cost savings evaluated at post-merger production (BHFG) need to be traded off against the net losses from reduced consumption (EHC). The specific example on Figure 1, which considers a unit cost reduction by 25%, shows that the internal cost savings outweigh the losses from reduced consumption. But note that if we had considered a unit cost reduction by only 12.5%, the reverse would have been true.

(2) From perfect competition to "partial monopoly"

This is the original scenario, considered by Williamson's article of 1968. Williamson thus assumes that a merger in an initially competitive industry "extends market power", but not to the monopoly extreme. Consider for example a price rise to P_3 instead of P_2. The result is a higher output after the merger, implying higher internal cost savings than in the first scenario, amounting to BIFJ. These need to balanced

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against the losses from reduced consumption, which are now only the triangle KIC. The unit cost reduction by 25% generates internal cost savings which by far exceed the losses from reduced consumption on Figure 1. In fact, under the assumed price increase of this example, total welfare would increase for *any* reduction in unit cost by more than 2%. This confirms the claim made by Williamson.

The difference between scenario 1 and scenario 2 shows that it is important to know the extent of the price increase after the merger. Scenario 1 had been considered by DePrano and Nugent (1969) in a critical review of Williamson's analysis. Williamson (1969) replied that the drastic price rise to monopoly considered by DePrano and Nugent (1969) is unrealistic, since a merged firm needs to take into account the risk of entry when raising its prices. Entry can almost never be blockaded, argues Williamson, and therefore one may expect that a merged firm will follow a "limit pricing strategy", taking into account *potential* competitors as well as *actual* competitors.

The debate between Williamson and Deprano and Nugent illustrates the importance of predicting the extent of the price increase after a merger. In other words, it is necessary to properly assess the nature of post-merger competitive interaction. The third scenario stresses that one should also properly assess pre-merger conduct.

(3) From "partial monopoly" to monopoly

To illustrate the importance of considering *pre-merger* market power in the same Figure 1, consider a merger in which the initial price is P_3, which exceeds marginal cost AC_1. After the merger the marginal cost is AC_2, and the monopoly price P_2 is charged.

In this scenario, total welfare changes from the area AKBI before the merger to the area AEFG afterwards. Therefore, the trade-off is between internal cost savings of BHFG and losses from reduced output of LKHI. In the example of Figure 1, which assumed a 25% reduction in unit costs, the internal cost savings would be sufficient. In fact, in the example any reduction in unit costs by 9% would suffice for welfare to increase.

A general intuition on the trade-off between internal cost efficiencies and the losses due to output reduction can be by considering a merger in industry which is initially non-competitive, and which causes a "small" reduction in total industry output, accompanied by a "small" internal cost efficiency. Generally speaking, the gain because

of internal cost savings is proportional to the industry output, the loss because of reduced output is proportional to the price-cost margin.[26] To assess the welfare trade-off, one therefore needs to have a good estimate of both pre-merger output and of pre-merger price-cost markups. Pre-merger output times the expected cost reduction would be approximately equal to the expected welfare gains. Pre-merger markups times the expected output reduction would be approximately equal to the expected welfare losses. Of course, the main empirical difficulty in comparing the expected gains to the expected losses is in the assessment of the expected cost reduction and the expected output reduction.

Which types of cost savings are valid to apply the framework of Williamson? Note that Williamson's formula does not depend on the actual type of efficiency that is realised; it is sufficient that the efficiency implies a reduction in average costs. There for, all types of efficiency in principle qualify for a Williamsonian type of defence, provided, of course, that they involve sufficiently large average cost reductions. Nevertheless, a case may be made that efficiencies that involve a marginal cost reduction are superior to those that do not. This is because in this case, it may generally be expected that the price increase will be lower than when there is no reduction in marginal cost.

1.3.2.2 Externality analysis

Williamsonian analysis evaluates the efficiency gains from unit cost savings over the *total* industry output. This approach is justified under the assumption that *all* firms in the industry participate in the merger. Of course, in practice, most mergers only take place among part of the firms in the industry. In this case, one should evaluate the internal cost savings at the – smaller – output of the merging firms. Another difficulty with Williamsonian analysis is that one needs to be able to measure the actual cost reduction that will be generated by the merger. It is, of course, in the interest of the merging firm to claim as high efficiencies as possible.

Farrell and Shapiro (1990) propose a methodology for evaluating mergers among some of the firms in the industry without a need for relying on internal efficiency claims. In a general Cournot setting, they propose to evaluate the externality

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26   Weiss (1992) provides some further results and computations on how to measure the

that is created by the merger. The externality of a merger consists of the sum of the effect on consumers and on the rival firms who did not participate in the merger. Farrell and Shapiro argue that if the externality is positive, then the merger must also increase total welfare since the proposed merger may be expected to also be profitable (otherwise it would not be proposed in the first place).

Farrell and Shapiro derive conditions under which price-increasing (i.e. output-reducing) mergers will generate a positive externality. In particular, they find that the market share of the merging firms should be sufficiently small. The intuition for their result is clear. When two (or more) firms merge in order to reduce output, there is an expansion of output by the competitors. The expansion by the competitors is less than the contraction of the merging firms. The result is an overall fall in output, accompanied by a reallocation of output from the merging firms to their competitors. Such a reallocation of output would be desirable if the merging firms are relatively inefficient (i.e. operate at a higher marginal cost) as compared to their competitors. A relative inefficiency of the merging firms would indeed exist if they have a relatively small market share. In sum, a small market share by the merging firms indicates their relative inefficiency, making a merger which reallocates output to the competitors desirable.[27] The opposite is of course also true: when two large firms merge to contract output, there will be a reallocation to relatively inefficient competitors so that the merger will create a negative externality. In this case, total welfare will only be positive if large internal efficiencies can be proven by the merger.

The main contributions of Farrell's and Shapiro's approach are twofold: (1) they point out a potentially important effect that has traditionally been ignored in assessing merger: a reallocation of output to competitors; (2) they demonstrate that due to this effect mergers may be beneficial even when there are no internal efficiencies (or when internal efficiencies cannot be proven). Their analysis applies to Cournot competition.[28]

In fact, the general message of their results also applies to other forms of oligopolistic interdependence. In particular, in the models of Bertrand competition with

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efficiency/competition trade-off in a Williamsonian framework.

[27] Verboven (1995) extend Farrell and Shapiro's Cournot model to allow for tacit collusive behavior. He finds reasonable conditions under which the externality effect of a merger is even more likely to positive than in Farrell and Shapiro's Cournot model.

[28] McAfee and Williams (1992) focus on some more specific aspects assuming increasing marginal cost. Barros and Cabral (199) apply the framework of Farrell and Shapiro to investigate mergers in open economies.

differentiated products of Davidson and Deneckere (1985), Werden and Froeb (1994) a price increase by the merging firms triggers price increases by the competitors. These positive responses are, however, typically less than the original price increase initiated by the merging firms. As a result, the market share of the merging firms decreases and a reallocation of production from the merging firms to the competitors takes place. Similar to the Cournot model, such a reallocation of output would be desirable if the merging firms are relatively inefficient, as would be the case when they have relatively small market shares.

The relatively simple specific conditions on the market shares that are provided in Farrell and Shapiro's Cournot analysis do not generalise to Bertrand models with product differentiation. This is natural, since the product differentiation is market-specific, and no simple general description can be provided. In Part 5, where we discuss the framework, we nevertheless attempt to provide some operational sufficient criteria that will hold for all oligopoly models.

1.3.2.3 Other studies

There has also been some literature that tries to draw inferences on the welfare from the mere fact that merger is proposed and thus is profitable.

Levin uses a model with homogeneous goods and quantity-setting firms to show that output-reducing mergers are never profitable if market share is less than 50% (assuming no internal efficiencies other than output rationalisation). Furthermore, any proposed (thus profitable) merger with a market share less than 50% increases welfare, whether it increases or decreases output.

Werden and Froeb (1998) consider the entry-inducing effects of mergers. Entry reduces the possibilities to raise price and thus the profitability. Hence, if we observe a (profitable) merger, it seems more likely that it will reduce price (and thereby deter entry). The entry possibility thus allows us to infer price reducing efficiencies. As stated by Werden and Froeb: "If firms are rational and informed, they merge only if they expect significant efficiency gains generated from merger, or they perceive substantial entry obstacles such as sunk costs. Consequently, the entry issue can be collapsed into efficiency considerations, and in the absence of strong evidence that an otherwise anti-competitive merger generates significant efficiency gains, there is a

sound basis for presuming that entry obstacles will prevent entry in response. (Thus the best way for courts to treat entry in many mergers may be not to consider it at all.)"

2. EMPIRICAL EVIDENCE

This part of the chapter reviews the empirical evidence on mergers. Most of this literature has not attempted to directly identify efficiency gains from mergers. The available empirical evidence may nevertheless help us to shed some indirect light on the existence and the magnitude of efficiency gains. Many studies have considered the effect of mergers on company performance, as measured by the accounting profits or the share prices of the firms. If company performance is found to increase, there is evidence that the merger created either market power or efficiency gains, or a combination of both. Unfortunately, such evidence is not sufficient to discriminate between the two explanations. Additional information may be gathered to obtain more conclusive results. For example, evidence on consumer prices and market shares are also potentially useful in disentangling the market power and efficiency effects. There are also some papers that study the effect of mergers on the competing firms' share prices. If these also rise, this suggests that market power is more important than efficiency gains, since increased market power tends to benefit the competitors, whereas reduced production costs tend to harm competitors.

The evidence on share prices, profitability and consumer prices may not only tell us something on the relative importance of market power and efficiency motives for merger. It may also indicate how the gains or losses from mergers are distributed between different groups in the economy. Since competition policy in the E.U. and other jurisdictions are partly motivated by distributional concerns, such knowledge is crucial for the proper design of merger control.

Section 2.1 considers the evidence on company performance, measured by accounting profits and stock prices. Section 2.2 discusses the literature that has attempted to disentangle the two motives market power and cost reductions. Finally, in section 2.3 we provide evidence from a limited number of studies that have attempted to *directly* quantify the importance of efficiency gains.

The main impression is that the available evidence is very limited in many respects. First, there are surprisingly few studies of the effect of merger on

productivity, price, and market shares. Second, the evidence on company performance is contradictory, and troubled by methodological problems. Third, most studies concern mergers in manufacturing during the 1960s and 1970s, with a clear bias toward mergers in the U.S. This evidence is not sufficient to draw any conclusions about the likely effects of mergers in different sectors.

Bearing in mind the above reservations, our main conclusions are the following. First, the empirical literature does provide some support for the fear that horizontal mergers increase market power. Second, there seems to be no support for a general presumption that mergers create efficiency gains. Third, in particular cases, however, mergers do create efficiencies. Moreover, empirical evidence indicates that costs savings are passed-on to consumers in the form of a downward push on price. It appears that there may be substantial variance in the efficiency gains from mergers. (Unfortunately, however, there does not exist any formal statistical testing that clearly indicates that the variance is high.) In sum, the empirical evidence suggests that controlling mergers is important, and that the presence and magnitude of efficiency gains may need to be examined on a case-by-case basis.

To complement this picture we believe that it would be valuable with a follow-up study. Such a study should, in our view, focus on empirical estimates of returns to scale. Such studies can be used at least as indirect evidence for the efficiency gains from mergers. It would also be desirable to deepen the survey into pass-on. In both cases, it should be possible to obtain results for specific industries.

2.1 Overall Company Performance

2.1.1 Effects of mergers on profits

The industrial economics approach studies merger performance by measuring the (accounting) profits of the merging parties before and after the integration. From a theoretical point of view, a merger may increase or decrease profitability. On the one hand, oligopoly theory predicts that horizontal mergers increase market power, i.e. the firms' ability to set a price above marginal cost. On the other hand, mergers tend to lower the merging parties' market shares, since the rival firms may have an incentive to expand their production as a result of the merger. The net effect of an increased mark-up but decreased sales is ambiguous. In addition, the effects of mergers on the internal

efficiency of the firms are also ambiguous. A merger may lead to rationalisation or scale efficiencies, but it also reduces competition in the product market, and may hence increase or create slacks in the organisation. Hence, the effect of a merger on the merging firms' profits is an empirical issue.[29]

In sub-sections 2.1.1.1 and 2.1.1.2 we review individual studies in detail. We treat the European and the non-European (mainly US) experiences separately to see if there are any systematic differences. The reader may skip these two sub-sections, and turn directly to the results in sub-section 2.1.3.

2.1.1.1 The European experience

A large-scale project consisting of studies from several European countries is reported in Mueller (1980a). The study by Mueller (1980b), discussed below, on U.S. mergers, is also part of this international comparison. An important advantage of this project is that all the studies use the same methodology. The data cover firms undertaking mergers during the period 1962-1972, for the five years preceding the merger and the five years afterwards. All studies use several different tests for the effect of mergers on profitability. Two measures of profitability are adopted, namely the rate of profit on equity, and the rate of profit on total assets. Two alternative methods are used to control for external shocks. First, the merging firms' profits are compared with a control group consisting of a pair of firms that are similar to the merged ones. Second, they are compared to the industry average.

Kumps and Wtterwulghe (1980) study 21 mergers in the manufacturing and retail sectors in Belgium during the period 1962 to 1974. They show that the merging firms performed better than a control group of non-merged companies. Their profit rates declined by less between the 5-year pre-merger period and the 5-year post-merger period, than those of the control group firms. Cable, Palfrey, and Runge (1980) study around 50 mergers in Germany during the period 1964 to 1974. They find that the merging firms did better than the control firms, although not in a statistically significant way. Jenny and Weber (1980) study 20 - 40 (depending on the test)

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[29]   One may argue that firms would not merge unless a merger is profitable. However, there are circumstances under which firms may merge, even if that lower their profits relative to the pre-merger situation (Roll, 1986 suggests a hubis hypothesis; Shleifer and Vishny, 1988, suggest an empire-building hypothesis; Fridolfsson and Stennek, 1999, suggest a pre-emption hypothesis).

horizontal mergers in France during the period 1962 - 1972. They show that the merging firms experienced decreasing profitability between the four-year pre-merger and four-year post-merger period. This reduction was larger than the reduction of the control firms, although the difference is not statistically significant. Peer (1980) studies around 30 mergers in the manufacturing and retail sectors in the Netherlands during the period 1963 to 1973. He finds that the merging firms did worse than the control firms did, although not in a statistically significant way. Rydén and Edberg (1980) study 25 large mergers in Sweden during the period 1962 to 1976. They show that the merging firms experienced a reduction in the profitability between the 5-year pre-merger period and the 5-year post-merger period. At the same time a control group of non-merged firms increased their profitability. Cosh, Huges, and Sing (1980) study 211 mergers in the U.K. during 1967 to 1969. They show that the merging firms experienced an increase in the profitability between the 5-year pre-merger period and the 5-year post-merger period. At the same time a control group of non-merged firms decreased their profitability. Meeks (1977) studies take-overs by large U.K. listed firms during the period 1964 to 1972. The typical target is small in comparison with a control group, but has average profitability. The typical buyer is large in comparison with a control group, and has a higher profitability. During the seven years following the take-over, the profitability of the integrated firm is typically reduced.

To summarise, the evidence on the European mergers during the 60s is mixed. Profitability improved on average, in comparison with control firms, in two countries (Belgium and Germany) and it deteriorated in three countries (France, Netherlands, and Sweden). The evidence on the profitability of U.K. mergers is mixed. One study finds that profitability has increased, another that profitability decreased, and it is not clear what causes the different results. Often the changes in profitability are small and insignificant.

2.1.1.2 The US and Japanese experience

As a part of the international comparison, discussed above, Mueller (1980b) studies around 250 mergers in the USA during the period 1962 to 1972. He compares profitability three years after and five years before the merger. The merged firms experience a loss in comparison to the non-merged firms.

Perhaps the most famous study – or actually, collection of studies - is by Ravenscraft and Scherer (1987). This is a very detailed study considering a large sample of U.S. mergers over a long time period. In one study, Ravenscraft and Scherer estimate the pre-merger profitability of 634 targets (chapter 3). All targets were manufacturing companies and they where acquired in 1968, 1971, or 1974. Their sample includes small and privately held companies, not listed on major stock exchanges. Profitability was measured by the ratio of annual operating income to total end-of-period assets. The average profitability of the targets was 20 percent. The average profitability of all manufacturing corporations was at the same time 11 percent. Hence, the targets were substantially more profitable. The difference is also statistically significant. Ravenscraft and Scherer also separately study the pre-merger profitability of ninety-five targets of 1962-1976 tender offers. These targets were slightly less profitable than the industries to which they belonged.

In another study, Ravenscraft and Scherer examine post merger performance, using so-called line of business data (chapter 4). That is, the unit of observation is not the acquiring firm, but the branch of the firm that made the acquisition. Branches are defined according to three- or four-digit level of the U.S. Standard Industrial Classification. Hereby, the sample consists of 4,409 lines of business observations. For each line of business, they have data on profitability for the years 1974-77, and on the merger history—as measured by ratio of the value of the acquired assets to total assets--between 1950 and 1977. (In total more than 7,000 acquisitions were undertaken, and the median acquisition was made eight or nine years before the date for measuring profitability.) In an ordinary least squares regression model, they show that merger intensity has a negative effect on profitability.

Ravenscraft and Scherer also study sell-off of acquired units (chapter 6). They estimate that between 19 and 47 percent of the acquired units were subsequently sold off. They also show that these units experienced a fall in profitability preceding sell-off, and that their profitability was below the profitability of non-divested lines in the same industry. Combining these observations with the observation from their chapter 3 that the acquired units were twice as profitable as the industry average, Ravenscraft and Scherer conclude that these units were in good health at the time of their acquisition, but became gravely ill thereafter.

Healy, Palepu and Ruback (1992) study the post acquisition performance of the 50 largest U.S. mergers between 1979 and mid-1984. They use pre-tax operating cash flow returns on assets, and they use industry performance as a benchmark. Data are collected for each of the five years before the merger and each of the five years after the merger (leaving out the year of merger). In the period before the merger, the merging firms earned a median annual return around 25 percent. After the merger the return has declined to around 20 percent. However, this decline was smaller than the decline experienced by other firms in the same industries. Hence, the industry adjusted median annual return was around zero percent before the merger. After the merger the industry-adjusted return has increased to around 3 percent.

Ikeda and Doi (1983) study the performance of forty-nine merging firms in the Japanese manufacturing industry 1964 - 1975. Profit rate is measured by the average current profit before tax as a percentage of end-of-year equity and end-of-year total assets. Data are collected for the five years before and after the merger. One test concerns the merging firms' absolute performance, and another test concerns the merging firms' performance in comparison with the performance of rival firms in the industry to which the merging firms belong. The absolute test shows that around 60 percent of the merging firms increased profitability, while 40 percent decreased profitability. In relative terms, 60 to 70 percent of the merging firms experienced an increased profitability.

2.1.2 Effects of Mergers on Share Prices

A second strand of literature has assessed the performance of mergers by studying the effects they have on the stock prices of the participating firms at the time of the merger announcement. The empirical methodology is called event study analysis. Basically, event study analysts estimate whether there is a significant difference in stock prices a few weeks before and after an "event" such as a merger announcement. The change in stock prices is measured net of market-wide price movements.

An important potential advantage of event-studies is that stock prices reflect the present value of expected *future* profits created by firms, under the assumption that the stock market is efficient. This approach differs fundamentally from the profitability studies based on accounting data. Accounting profits only refer to *current* profits,

which may be subject to exceptional temporary gains or losses; in addition, the accounting profits depend on the precise methods that have been used to classify revenues and costs.

The evidence is summarised and discussed in sub-section 2.1.3. In the preceding three sub-sections we review individual studies in more detail. As is conventional, we report results on returns to targets (2.1.2.1), bidders (2.1.2.2) and total returns (2.1.2.3) separately. The reader may skip the first three sub-sections, and turn directly to the summary.

2.1.2.1 Returns to targets

The results concerning targets are relatively clear. The average target shareholder gain varies between 20 to 35 percent. The target gains more in tender offers than in mergers. The gain is higher if there is more than one bidder. The gains have varied over time, due to changes in the legal and institutional environment.

Jensen and Ruback (1983) review 13 early event studies. Six studies concern mergers, and seven concern tender offers. The period is 1956 to 1981. The abnormal percentage stock price changes associated with successful corporate take-overs was 30 percent for tender offers, and 20 percent for mergers. Jarrell, Brickley, and Netter (1988) survey event studies that cover take-overs made in the 1980s. (Many of their conclusions come from a study of 663 successful tender offers from 1962 to 1985.) The target premiums averaged 19 percent in the 1960s, 35 percent in the 1970s, and from 1980 to 1985 the average premium was 30 percent. Bradley, Desai, and Kim (1988) use a sample of 236 successful tender offers occurring over the period 1963 to 1984. The mean target gain for the whole period was 32 percent. They also show that competition among bidding firms increase the returns to targets, and decrease the returns to acquirers. Schwert (1996) studies 1814 targets in successful and unsuccessful take-overs during 1975 to 1991. The average gain in tender offers was 36 percent and in mergers 17 percent. He also shows that the total return to the target consists of two approximately equal parts, namely the mark-up (which is the increase in the stock price beginning the day the first bid is announced), and the run-up (which is the increase in the stock price in the period of 40 days before the first bid). The mark-ups are essentially unrelated to the size of the run-up. One interpretation of this result is that the run-up reflects information held by other potential bidders, rather than

insider trading or information leakage. If this interpretation is correct, then previous event studies may have exaggerated the gains from mergers since they normally include the run-up as a part of the merger premium.

2.1.2.2 Returns to bidders

The event study evidence on bidder gains is mixed, but it suggests that bidders on average break-even, or do slightly better. Naturally, however, there is some variance, meaning that some bidders gain while others lose.

In Jensen's and Ruback's (1983) survey, the abnormal percentage stock price changes associated with successful corporate take-overs was four percent for tender offers, and zero percent for mergers. In Jarrell, Brickley, and Netter (1988) bidders realised a small, but statistically significant, gains of about one to two percent. They also show that this gains has declined, to become negative (statistically insignificant) in the 1980s. Bradley, Desai, and Kim (1988) confirm this pattern.

2.1.2.3 Total returns

The evidence indicates that shareholders of target firms realise large positive abnormal returns in take-overs. The evidence on the rewards to bidding firms is mixed, but suggest that they break even. Since targets gain, and bidders do not appear to lose, the evidence seems to suggest that take-overs create value to the participating firms. However, as pointed out by Jensen and Ruback (1983) the bidding firms tend to be larger than target firms. Hence, the sum of the returns to bidding and target firms does not measure the gains to the merging firms. The dollar value of small percentage losses for bidders could exceed the dollar value of large percentage gains to targets. Or, as Roll (1986) says, in some cases the observed increase in the target would correspond to such a trivial loss to the bidder that the loss is bound to be hidden in the bid/ask spread and in the noise of daily return volatility. Roll reviews the evidence up to 1985 and argues that it is inconclusive.

More recent studies provide more conclusive evidence. Bradley, Desai, and Kim (1988) explicitly construct their sample so as to match pairs of targets and bidders in order to measure synergistic gains. During the whole period, the average combined gains is 7 percent, and statistically significant. Stulz, Walking and Song (1990) study 104 tender offers during the period 1968 to 1986 and find an average gain of about 11

percent, which is statistically significant. Berkovitch and Narayanan (1993) find that 76 percent of 330 successful tender offers from 1963 through 1988 achieved positive total gains. Houston and Ryngaert (1994) demonstrate that the overall gains from a sample of bank mergers announced during the period 1985 to 1991 are slightly positive, but statistically indistinguishable form zero. Banerjee and Eckard (1998) show that the participants in the great U.S. merger wave of 1897 - 1903 gained between 12 and 18 percent. Based on the more recent evidence, we conclude that the total gains on average are positive.

However, the long-term effects may be different. Rau and Vermaelen (1998) show that bidders in mergers under-perform (while bidders in tender offers out-perform) the market in the three years after the acquisition. The long-term under-performance of acquiring firms is not uniformly distributed across firms. It is predominantly caused by the poor post-acquisition performance of low book-to-market "glamour" acquirers.[30] To explain their findings, Rau and Vermaelen propose a performance extrapolation hypothesis. The management, as well as the market, the board of directors, and the large shareholders over-extrapolate the past performance of the bidders' management when they assess the benefits of an acquisition. That is, the market overestimates (underestimates) the ability of glamour bidders (value firms) to manage other companies' assets.

2.1.3 Summary and conclusions

Profit flow studies: If a generalisation is to be drawn from the profit-flow studies, it would have to be that mergers have but modest *average* effects on the profitability of the merging firms. A robust finding, however, reappearing in many studies is that the profitability of mergers is not guaranteed: a large proportion of mergers reduces profitability.

This result can be interpreted in several ways. The worst case scenario is that in many mergers market power is increased, but that the mergers create internal *in*efficiencies in the firm that offset any profit increases. Another possibility is that there were no effects on production costs on average, and that losses are due to competitors expanding their production in response to mergers. This is a very

surprising result. It is not difficult to understand that a merger can be socially undesirable. But why should firms engage in activities that are even bad for them? This is an issue to which we will return below.

It is important to keep in mind that there is variance around the mean profit effects. Some mergers are profitable, and some mergers are unprofitable. This result is consistent with the view that some, but not all, mergers do create efficiencies. This is important, since it suggests that policy should not count on general cost savings from mergers, but that policy somehow should allow for cost savings in specific cases–perhaps an efficiency defence.

The available evidence is limited in several respects. Most studies concern mergers in manufacturing during the 1960s and 1970s. The evidence is not sufficient to draw any conclusions about the likely effects of mergers in different industries.

The empirical methodology adopted in the above mentioned and other studies is not homogeneous. For example, some studies simply consider the profitability of the merging firms before and after the merger. Other studies are more sophisticated in that they compare the profitability of the merging firms with other firms in the same industry in order to control for other changes that may have affected profitability during the studied period. However, as Fridolfsson and Stennek (1999) point out, the use of competing firms to control for exogenous shocks creates its own problems. The reason is that a merger normally confers an externality on the outsiders. When two firms merge and reduce competition, the remaining competitors also gain. In fact, the outsiders may gain more than the merging firms (so called strong positive externalities). The reason is that the outsiders gain from the increase in the price, without having to reduce their own production. Thus, what appears to be an unprofitable merger, may simply be a profitable merger with a strong positive externality. The reverse is also true. What appears to be a profitable merger may be an unprofitable merger with strong negative externalities. These problems warn us that one should interpret the results of the studies with care.

Event Studies: The event study evidence shows that the target firms' shareholders benefit (20-35 percent), and the bidding firms' shareholders generally break even (in the short run). Moreover, the combined gains are mostly positive (up to

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[30]   Rau and Vermaelen interpret a low book-to-market value as an indication that the current

10 percent gains). The increased total gains seems to suggest that merging firms either increase market power or experience efficiency gains, such as cost savings.

Unfortunately, almost all event studies discussed above use data from the U.S. It is not clear to what extent these studies are also representative for Europe.

Furthermore, recent results invite to some caution concerning the event study methodology. First, Rau and Vermaelen (1998) show that the bidders' *long term* performance is often negative. This may be interpreted to say that the short-term price movements in the stock market are not very good at predicting merger performance. If this interpretation is correct, Rau and Vermaelen's results should be perceived as evidence against the efficient market hypothesis underlying the (short-term) event study methodology.[31] If the efficient market hypothesis is rejected, it is not clear how one should interpret the results in the earlier literature discussed above. Second, empirical evidence suggests that the measures of target gains may include other information than just the take-over (Schwert, 1996). Third, Fridolfsson and Stennek (1999) argue theoretically that changes in share-prices may reflect other information than the profitability of the merger (see below). There are also some general problems associated with event study methodology that do not only affect studies of mergers. For example, the practical measurement of the stock price effects of certain events is clouded by other events influencing stock prices. Furthermore, it is not obvious exactly which event that should be taken as the (merger) event.

From this evidence, our two main conclusions are:

1. Merger control should not be based on a general presumption that mergers create cost savings. The presence and magnitude of efficiency gains may need to be examined on a case-by-case basis.

2. The available evidence on profitability and share prices does not point at any easily observable conditions under which to expect efficiency gains.

We have already argued that both studies of profitability and studies of share prices are troubled by methodological problems. Furthermore, if one combines the evidence from studies of profitability and studies of share prices the emerging picture is mixed, and perhaps even confusing. The available evidence indicates that a large

management is efficient in managing the firm's assets.

proportion of mergers reduce profitability, but that share prices rise. If the evidence from both types of studies is correct, we are left with two empirical puzzles (cf. Caves, 1989; Sherer and Ross, 1990): Why do unprofitable mergers occur? How share prices increase when profitability falls? Most theoretical explanations for why unprofitable mergers may occur rely on the idea that owners of the firms lack the instruments to discipline their managers, and that the managers consistently overestimate their abilities (Roll, 1986), or that the managers are motivated by a desire to build a corporate empire (Shleifer and Vishny, 1988). Neither the hubris nor the empire building hypothesis explains why the share prices may increase at the same time as the profit flows decrease. In an attempt to answer both puzzles, Fridolfsson and Stennek (1998) propose a hypothesis called the pre-emptive merger motive. Firm A may merge with firm B, even if the merger reduces their combined profit flow as compared with the status quo. This would happen if the relevant alternative is that firm B merges with firm C, and this alternative merger would reduce firm A's profit flow even more. Expressed differently, even if a merger reduces the profit flow compared to the initial situation, it may increase the profit flow compared to the relevant alternative—another merger. Furthermore, even though such a pre-emptive merger reduces the profit flow, the aggregate value of the firms—the discounted sum of all *expected* future profits— may actually increase. The reason is that the pre-merger value of the firms accounts for the risk that the firms may become outsiders. Under the hypothesis that the stock market is efficient—in the sense that share prices reflect firm values—these results demonstrate that the two strands of the literature may be consistent. In particular, the event studies can be interpreted to show that there exists an industry-wide anticipation of a merger, and that the relevant information content of the merger announcement is which firms are insiders and which are outsiders. To sum up, these theories give a rather pessimistic picture of mergers. They may be motivated by hubris, or empire building, or an attempt to pre-empt other mergers. According to these interpretations of the available evidence, both market power and cost savings may be secondary motives for mergers. Nevertheless, even if the motives are different, the mergers still affect both market power and costs.

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[31] Actually, Rau and Vermaelen argue that there is a growing body of evidence that short-term measurements of abnormal performance do not capture the full effects of the stock market reaction to an event.

2.2 Disentangling market power and cost reductions

2.2.1 *Effects of Mergers on Product Prices*

2.2.1.1 Direct Studies

There are surprisingly few studies of the effect of merger on product prices. But the few studies that have been made, unambiguously indicate that price tends to rise as a result of merger. These results are of course not inconsistent with mergers leading to more efficient operations. Yet, the impact of efficiency gains on price is more than offset by increased market power, at least in the cases studied in the economics literature. One may conclude that wealth gains to the stockholders of merging firms do not arise through value creation alone, and relaxation of antitrust policy may result in nontrivial wealth transfers from consumers.

A general methodological difficulty with a study of the price effects of mergers is that one should properly take into account other conditions that may have changed after the merger, for example changes in factor prices. This problem has been tackled by studying how the prices of the merged firms' products have changed in comparison to other prices.

Barton and Sherman (1984) estimate the price effects of two acquisitions that resulted in substantial increases in the market share of the acquiring firm. Both acquisitions were made by Xidex Corporation the world's largest producer of duplicating microfilm. In 1976 Xidex acquired its major rival in so-called diazo microfilm, and thereby increased its U.S. market share from 40 percent to 55. In 1979 it acquired its main rival in vesicular microfilm, thereby increasing its U.S. market share from 67 percent to 93. The study uses data on actual transaction prices during the ten-year period 1973 to 1982. To control for the influence of general inflation, costs of inputs, and gains in productivity, they used price *ratios* of vesicular and diazo microfilm. This methodology biases the results against finding any effects from the mergers to the extent that the two products are good substitutes. The results indicate that the increase in the price of diazo film at the first merger was around 11 percent, and that the increase in the price of vesicular microfilm at the second merger was around 23 percent. Both estimates are significant at the 0.01 level. One may also note

that latter merger, which almost created a monopoly, increased the price more than the former merger.

Kim and Singal (1993) examine price changes associated with all airline mergers, and all routes affected by those mergers for which data are available, in the U.S. during 1985-1988. This is a natural experiment since during that period the U.S. government did not contest any proposed merger in the airline industry. Another advantage of studying the airline industry is that each route can be considered a separate market. Moreover, each merger affects hundreds of routes. Thus, each of the 14 mergers generates a large number of observations. To identify price changes that can be attributed to mergers, they compared the fare change of a sample route with the average fare change in a control group. There are, on average, 196 unaffected routes for each merger to be included in the control group. The results show that over the period from merger talks through merger completion, the merging firms increased airfares by an average of 9 percent relative to a control group of routes unaffected by the merger. Rival firms responded by raising their prices by an average of 12 percent.[32] The fare changes are also positively related to the distance of routes, suggesting that airlines exploit greater market power on longer routes for which substitution by other modes of transport is less likely. Kim and Singal also study the announcement and completion periods separately to identify the effects of market power and synergy. They show that during the announcement period—when changes are primarily due to the market power effect—prices are increased (plus 11 percent), but that during the completion period—when changes are primarily due to efficiency—prices decrease (minus 9 percent). These results concern mergers that do not include failing firms.[33] Another interesting result is that Kim and Singal show that there exists a significant positive relation between fare changes and changes in concentration. Finally, they reject the idea that the mergers generated gains in quality that offset the price increases. The number of customer complaints filed with a governing agency increased almost threefold during the studied period.

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[32] This result may be upward biased due to the fact that anti-competitive price increases may come immediately after the merger while efficiency gains may only come in the long run.

[33] Financially distressed airlines show a completely different pattern. They were initially setting prices well below the industry average. During the announcement period the merging firms cut their prices by an average of 19 percent, further increasing the gap to the industry average. In failing firm mergers, prices were increased by 40 percent during the completion phase.

Borenstein (1990), and Werden, Joskow, and Johnson (1991) study the effect on airfares of two airline mergers that occurred in 1986: the TWA-Ozark and Northwest-Republic mergers. They find a significant increase in relative airfares on routes affected by the Northwest-Republic merger, but little or no evidence on fare increases associated with the TWA-Ozark merger.

Finally, we should mention a very different type of study. Cotterill (1990)[34] study the effect of 6 horizontal mergers, among supermarket in the U.S., on concentration, the price level, and the consumer food bill. First, Cotterill observes pre- and post-merger market concentration, and computes how the mergers change market concentration, as measured by the Herfindahl index. Second, Cotterill uses a previously established empirical relationship between market concentration and the market price level, to predict the impact of the mergers on the price level. Finally, he computes the implied increase in the consumer food bill. Using this methodology, and depending on the size of the merger, Cotterill predicts price changes in the range from fractions of a percent up to three percent. This methodology is obviously very indirect, and it does perhaps not provide much evidence about the price effects of mergers. However, it is interesting since it could be used by competition authorities as a way to predict the likely effect of merger on price. However, to do so one first needs to validate the methodology by comparing predictions with actual results.

2.2.1.2 Indirect Studies

The number of empirical studies of the effects of mergers on prices is surprisingly small. For this reason it is worth to consider also the indirect but complementary evidence obtained in studies that compare prices between geographically separated markets with different concentration levels. If high concentration is associated with high prices, this is indirect evidence that horizontal mergers increase price, that is the market power effect dominates the efficiency effect.

Schmalensee (1989) have previously surveyed this cross-section literature. According to Schmalensee the main stylised fact that appears from these studies is that there exists a positive relation between concentration and the price level (stylised fact 5.1). Bresnahan (1989) also argues that the cross-section studies confirm the existence

of a relationship between price and concentration. In order to provide some feeling for these studies, we describe some of them here as well.

The U.S. food retailing industry has been the subject of two studies. Lamm (1981) studies 18 major Standard Metropolitan Statistical Areas in the U.S., covering the period from 1974 to 1977. He identifies a positive relationship between food prices and market concentration. Moreover, the results indicate that increases in the market shares of any of the three largest firms increase price, while an increase in the size of the fourth largest firm reduces market price. This evidence may indicate that three firms may collude, but that collusion becomes more difficult when there are four or more large firms. Lamm also finds that increased average store size reduces the market price. To be more exact, increasing average store size by ten percent, reduces the price by around five percent. This is consistent with the existence of scale efficiencies. Hence, to the extent that a merger realises scale efficiencies it may actually reduce price. Using individual firm price levels, Cotterill (1986) studies 18 local food retail markets in Vermont, each market being served by between one and seventeen super markets. He shows that different firms in the same market charge different prices that are based upon firm specific characteristics, such as chain-dependence, capacity utilisation, and store size. After controlling for these factors, market concentration has a significant impact on a firm's price level. Marvel (1978) studies the retail gasoline market in 22 U.S. cities for the years 1964 to 1971, and finds a statistically significant relation between concentration, as measured by the Herfindhal index, and price. In particular, he finds that high concentration leads to relatively high prices in the "low-price segment" of the markets. Geithman, Marvel and Weiss (1981) review and extend some previous papers and search for so-called critical concentration ratios. They look at the markets for underwriting, gasoline retailing, and supermarkets. If a critical concentration ratio were found, below which concentration had no effect on price, it would be of great importance because of its implications for competition policy. It would seem to follow that a horizontal merger in a market where concentration was below the critical level and where the merger could not increase concentration above the critical level could not increase market power, or at least would lead to efficiencies that outweigh increased market power. They show that critical concentration ratios may exist in certain industries, for example, a four firm concentration ratio about 50. In other industries, for example supermarkets, no critical level was found. They conclude

that a single critical concentration ratio for all of manufacturing is likely to be incorrect.

More recently, two studies on European markets appeared. Verboven (1996) analyses international differences in automobile prices in five European countries: Belgium, France, Germany, Italy and the United Kingdom. He estimates price-cost margins and finds that they tend to be larger for firms with higher market shares. In particular, domestic firms with a large market share, such as Fiat Group in Italy, have strong domestic market power. Belgium, which has the lowest concentration, shows the lowest price-cost margins for most automobile models. Asplund and Sandin (1996a) study 543 driving schools in 250 local Swedish markets for 1995. Driving schools are generally small, family owned businesses with a median of two cars and two employees. The mean market price per minute varies from SEK 4.5 to 8.0. However, there is almost no variation within a market. The results show that if prices in nearby markets are low and the distances to them are short, prices tend to be lower. It is also shown that prices are increasing in firm concentration within a local market.

Bresnahan and Reiss (1990, 1991) propose another methodology. The novelty is that it can be applied in cases when data on prices are not available. Again, the idea is to study different geographically separated markets. In particular, they focus on how the number of firms in each market relates to market size. To enter into a market a firm must be able to cover its fixed costs. A monopolist can charge a high margin, i.e. it can set a high price in relation to its marginal cost. As a result, the monopolist may need a relatively small market to cover its fixed costs. For example, if the fixed cost is 100, and if the (constant) marginal cost is 1, and if a monopolist can charge a price of 2, it must sell at least 100 units to break even. If consumers buy at most 1 unit of the good, the market size must be at least 100 consumers. Consider two scenarios. Assume first that the data reveals that in order for a market to support two firms, the market size must be at least 400 consumers. Then we can infer that the duopoly price is 1.5. (That gives a margin of 0.5. This margin multiplied by 200 consumers (per firm) gives 100 which is exactly enough to cover fixed costs.) Assume next that the data reveals that in order for a market to support two firms, the market size must be at least 200 consumers. Then we can infer that the duopoly price is 1 (equal to the monopoly price). In short, by studying how the number of firms relate to market size, we may infer how market power relates to the number of firms. Using this methodology,

Bresnahan and Reiss study several markets (medical, dentists, plumbers and tire-sales) in the U.S. They suggest that competition is significantly increased when the second or the third firm enters into the market. At lower concentration levels, however, the effect of the number of firms on the margins appears to be marginal. Asplund and Sandin (1996b) obtain similar results for Swedish driving schools. In the context of mergers, this may be taken to indicate that mergers in market with three or two firms are detrimental to allocative efficiency. Such an interpretation requires of course that new entry is not immediate.

2.2.2 Effects of Mergers on Market Shares

There have been a few studies that analysed the effects of mergers on the market share of the merged entity. If a merger is driven by market power, the merged firm will increase its price and lower its output. This initial change will increase the residual demand for the competitors. As a response to the demand increase, the competitors will normally increase both their prices and their output. The exact mix of these two elements depends on the nature of competition.[35] A robust prediction is that the market share of the merged firm will drop if the merger is driven by market power. In contrast, if the merger generates sufficient variable cost synergies, the merging firms may increase their market share. Actually, mergers that tend to increase the price level should also tend to reduce the merging firms' market share, and mergers that tend to decrease the price level should also tend to increase the merging firms' market share.[36] Hence, studying the effect of merger on market shares, in principle, gives very similar information as a study of prices.[37]

Again, the number of studies is very small. Nevertheless, the available evidence, if anything, seems to suggest that the market shares of firms engaged in horizontal mergers decline. The evidence on the effects on market shares from non-horizontal mergers is mixed.

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[35] For example, the Cournot model predicts that competitors would respond by increasing their output relatively much, whereas the Bertrand model predicts that competitors respond by increasing their prices relatively much.

[36] This statement is at least true in simple models of oligopolistic competition.

[37] Another reason for why it is interesting to study market shares is that firm profitability is positively related to market share (Mueller, 1983). Thus, a big reduction of market share may be taken to indicate a reduction of profitability.

Goldberg (1973, cited in Mueller 1985) examined a sample of 44 companies acquired in the fifties and sixties and found no significant change in market shares or growth rates in the (median three and a half) years following the mergers. Mueller (1985) uses surveys for 1950 and 1972 of sales at the 5-digit level for the 1,000 largest companies in the U.S. He constructs a sample of 209 acquired firms and 123 acquiring firms together with a control group of firms that did not participate in mergers. Control groups are formed to match the merging firms' characteristics. The control-group to firms participating in conglomerate or vertical mergers retained 88.5 percent of their 1950 market share in 1972. Firms participating in a non-horizontal merger, on the other hand only retained 18 percent of its market share. The corresponding figures for horizontal mergers are 55 percent and 14 percent respectively. Baldwin and Gorecki (1990, cited in Mueller 1997) find significant declines in market shares for plants acquired in horizontal mergers, but no significant changes for plants acquired in other sorts of mergers.

2.2.3 Effects of Mergers on Outsiders' Share Prices

The results on the merging firms' stock price performance do not disentangle the gains attributable to increased market power and the gains attributable to, for example, technological efficiencies. As a solution, Eckbo (1983) proposes to indirectly disentangle both types of effects on profitability by also considering the effect of stock prices on the competitors that are not involved in the merger. The idea is that mergers driven by market power motives are beneficial to competitors: any attempt to raise prices or restrict production by the merging firms also benefits the competitors. In contrast, some types of efficiencies should hurt the competitors, for example cost efficiencies that induce the merged firm to lower its prices, in which case the stock price of the competitors would drop.

Unfortunately, the available evidence on this point is not conclusive. Stillman (1983) finds no statistically significant effect on outsiders' share prices. Eckbo (1983) finds a small but statistically significant increase. However, the latter study is also inconclusive: in those cases where competition authorities announce an investigation of the merger, the outsiders' share prices are not affected in a significant way. Schumann (1993) confirms this pattern.

Banerjee and Eckard (1998) show that the competitors during the Great Merger Wave of 1897 - 1903 suffered significant value losses, around 10 percent. This result may be interpreted as evidence for the existence of price-reducing efficiencies. A potential criticism to this approach is that anti-competitive mergers without efficiencies may hurt the rival firms if they are of a predatory nature. Banerjee and Eckard (1998) argue that the competitors' losses during the great merger wave are not associated to predatory practices of the merged firm. The reason is that there is no statistically significant difference between the returns to outsiders when the merging parties have high market shares (and where predation is more likely to be effective) and when the merging parties have low market shares. These results are consistent with the idea that efficiency gains were involved in the great merger wave.

Singal (1996) develops this methodology even further by combining stock-price data with product market data. The study concerns 14 airline mergers in the U.S. during 1985-1988. Singal relates changes in stock-prices of merging and rival firms to the change in market concentration (measured by Herfindhal index), and to the number of common airports of the merging firms. The latter is considered to be an indication of the presence of efficiency gains from a merger. The results show that common airports are positively related to gains for insiders and losses for outsiders - interpreted as evidence of efficiency gains. The results also show that a large increase in concentration is associated with gains for outsiders and no effect on insiders - interpreted as the classical free-rider problem, associated with mergers that increase market power.[38]

2.2.4 Summary and conclusions

There is considerable dispute concerning the welfare effects of mergers. Are mergers mainly motivated by market power or efficiency gains? The two strands of the empirical literature, industrial economics and financial economics, reach apparently contradictory results.

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[38]   One may question to what extent Singal succeeds to identify market power and cost reduction. First, if two airlines have a large number of common airports, they probably also have common routes. Hence, common ports should not only indicate scope for efficiencies, but also for anticompetitive effects. Second, the so-called free rider problem should be smaller, not bigger if the change in concentration is big.

The industrial economics literature studies the effect of mergers on product prices and market shares. There are surprisingly few such studies,[39] but they unambiguously indicate that prices tend to rise, and that insiders' market shares tend to fall as a result of horizontal mergers. A reasonable interpretation of this evidence is that mergers create market power, and that any cost reductions are insufficient to dominate (from a consumer's perspective). However, the evidence is also consistent with the idea that mergers increase rather than reduce costs. These studies indicate that horizontal mergers reduce consumers' welfare, by transferring wealth to firms, and by creating dead-weight losses.

Financial economists use the event study methodology to disentangle market power and cost saving effects in horizontal mergers. Eckbo (1983), Eckbo and Wier (1985), Banerjee and Eckard (1998) and others use event studies to evaluate the welfare effects of horizontal mergers, by examining how the outsiders' share prices move in response to the announcement of a horizontal merger, and a subsequent announcement of an antitrust complaint. If the outsiders' share prices increase (decrease) at the time of the first (second) announcement, then the merger is deemed anti-competitive. The reason is that an anti-competitive merger raises the product price, thereby increasing the outsiders' profits. Unfortunately, the available evidence on this point is not conclusive. All studies of modern mergers find no or only small effects on outsiders' share prices. This can be interpreted as either the absence of both market power and efficiency effects, or their offsetting presence.[40]

The event study approach has been criticised by McAfee and Williams (1988), and Fridolfsson and Stennek (1999). McAfee and Williams turn the event study procedure around and ask whether rival firms' stock prices move in the predicted directions when a horizontal merger with ex post known anti-competitive effects is announced and, subsequently, challenged. The empirical results show absolutely no evidence of the merger being anti-competitive. Indeed, the signs of the estimated coefficients are generally opposite to their predicted values, given that the merger was

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[39]   Barton and Sherman (1984), and Kim and Singal (1993) study product prices. Mueller (1985) studies market shares.

[40]   Eckbo (1983) finds little evidence of horizontal mergers being anti-competitive. This is surprising, since the sample only includes mergers that were challenged as anti-competitive. Based on this evidence, Eckbo and Wier (1985) draw strong policy implications: "all but the 'most overwhelmingly large' mergers should be allowed to go forward".

anti-competitive. This finding casts doubts on event studies being able to detect anti-competitive mergers, and the policy implications of such studies. McAfee and Williams argue that their result is likely due to the fact that the outsiders, in their sample, were large multi-product firms that derived only a small fraction of their revenues from the affected market. Fridolfsson's and Stennek's theoretical model provides an additional explanation why event studies fail to detect anti-competitive mergers. In fact, they show that the effect of an anti-competitive merger on the rivals' stock value may be the opposite to what is generally believed, exactly as is suggested by McAfee's and Williams' empirical evidence. If a merger increases the price and has a positive externality on the outsider, but becoming an insider is even more advantageous, then the outsiders' value is always reduced. Assuming that the stock market is efficient, anti-competitive mergers may reduce the outsiders' stock market value. Intuitively, the pre-merger value of the outside firm is high, since it reflects the possibility of becoming an insider. Once the merger has taken place, this possibility is excluded, and the outsider's share price is reduced. The new information in the merger announcement is which firms are insiders and which are outsider. As a consequence, of this critique, we believe that the direct studies of the effect of merger on prices are more reliable than the Stillman-Eckbo methodology.

A study by Singal (1996) combines stock-price data with product market data (for example concentration). This study provides some evidence that 14 airline mergers in the U.S. during 1985-1988 did create both market power and reduce cost.

2.3 Studies of Efficiency Gains and Pass-on

2.3.1 Effects of Mergers on Productivity

The most direct way of assessing the efficiency gains from mergers is by measuring productivity gains and economies of scale realised following a merger.[41] Some studies do this using statistical techniques, others confine attention to particular cases.

Berger and Humphrey (1992) study 57 U.S. banking mega-mergers from 1981 to 1989. They estimate a neo-classical cost function which allows them to consider two types of efficiencies, namely scale economies, and X-efficiency (or slack).[42] Earlier studies have shown that there are not substantial cost efficiency gains to be make

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[41]   See Caves (1989) and Scherer and Ross (1990) for useful overviews.

simply by increasing the size of already large banks. In fact, there may be slight scale diseconomies of scale. On the other hand, a growing literature on X-inefficiencies in banking, or variations in cost ascribed to differences in managerial ability, finds that these efficiencies account for cost variations of 20 percent or more and that these differences are stable over time. Thus, if more efficient banks take over less efficient banks, a merger could create substantial efficiency gains. Berger and Humphrey produce three main results. First, the ex ante choice of merger partners often did satisfy the condition for being conducive to improving X-efficiency. In 55 to 72 percent of the cases, the acquiring bank was more efficient than the acquired. Also, more than 70 percent of the mergers partners has some geographical market overlap. Second, the mergers were not successful on average in improving cost efficiency. The average X-efficiency improvement was less than five percentage points and was not statistically significant. Moreover, because of diseconomies of scale, the consolidated firms actually performed slightly worse on average after the mergers, although also this effect was also small and often not statistically significant. However, there do appear to be some very successful mergers as well as some very unsuccessful ones. Third, Berger and Humphrey go one step further and relate their *ex post* efficiency results to some *ex ante* conditions that are commonly believed to be indicators of expected efficiency effects (large difference in X-efficiency between the acquiring and the acquired banks, and a large degree of deposit market overlap). They find that *ex post* cost efficiency gains are not significantly positively associated with these *ex ante* conditions.

A couple of papers study how productivity varies according to the diversification of firms activities.[43] Their results show that productivity declines as firms become more diversified. However, since these studies concern diversification mergers, they need not carry much information concerning the efficiency effects of horizontal mergers.

An example of a case study is provided by Scherer, Backstein, Kaufer, and Murphy (1975, cited in Scherer and Ross, 1990). They study the 1969 merger of three English anti-friction bearing manufacturers. The firms sold extensively overlapping lines of general-purpose bearings. Immediately following the merger, production assignments were revamped to eliminate duplication and lengthen runs. Within three

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[42]   See also Akhavein, Berger and Humphrey (1997) for a profit function approach.

[43]   See Caves and Barton (1990) and Lichtenberg (1992). Both studies are reviewed in Mueller (1997)

years, output per employee had been improved by some 40 percent, at least partly as a result of the increased specialisation. Further improvements were expected after some time, as a result of increased mechanisation. Similar, but less dramatic cases of cost-savings are described in the same study.

Some economists argue that capital-raising (a form of purchasing economy) is much cheaper for large than small firms. As a consequence, when a small firm joins a large firm, the smaller firm is likely to benefit from the larger enterprise's lower cost of capital. Case studies by Ravenscraft and Scherer (1987) reveal that this may be one of the most compelling advantages of mergers.

Finally, Fisher and Lande (1983) review a set of case studies of mergers (many from the trade and general business press). They emphasise that it is dangerous to generalise from examples. Nevertheless, they argue that many individual mergers create substantial efficiencies, that many others are notable failures, and that the record of prediction is too poor to give any confidence that we can predict the level of cost saving on a case-by-case basis sufficiently accurately to make this prediction a major basis for public policy.

2.3.1.1 Indirect evidence

There exists an empirical literature that estimates returns to scale. This literature may be used to assess indirectly the opportunity that mergers realise cost savings related to returns of scale. A second advantage with this literature is that is can be used to say something about individual industries. This evidence is reviewed in, for example, Scherer and Ross (1990).

We may use the study by Scherer, Backstein, Kaufer, and Murphy (1975) to illustrate the types of results that are obtained. The study is based on an interviewing program covering twelve major industries in seven industrialised nations. The industries are beer brewing, cigarettes, cotton, paints, petroleum refining, leather shoes, glass bottles, Portland cement, integrated steel, anti-friction bearings, refrigerators, automobile storage batteries. They report estimates of the minimum efficient scale, the percentage of 1967 U.S. demand covered by a minimum efficient scale plant, and the percentage increase in cost that would result from operating a plant at one third of the minimum efficient scale. The estimates indicate that the minimum efficient scale constitutes between 0.2 percent of U.S. demand (leather shoes) and 14.1

percent (refrigerators). The percentage cost increase of running at a smaller scale ranges from 1.5 percent (leather shoes) to 26 percent (Portland cement). In half the industries the cost-elevation is five percent or less.

The relevance of such results to assess the efficiency gains from merger is not obvious. However, we believe that numbers like these may provide useful background information for anti-trust authorities when evaluating the likely consequences of a merger. It may therefore be useful to complement our preliminary description with an in depth investigation to this literature, and to synthesise the results (i.e. collect more studies, in particular more updated studies, arrange them by industry, and compare them with relevant demand figures for Europe and parts of Europe) so that they may be used in merger analysis.

2.3.2 Effects of Mergers on Innovation

According to Schumpeter (1942), it is essential to distinguish between the organisation of industries most conducive to solving the problem of excessive pricing and those organisational forms most conducive to rapid technological progress. In his view, a large firm operating in a concentrated market is the most powerful engine of progress and long-run expansion of output. There are several theoretical arguments to substantiate the Schumpeterian claim. Large firms may have larger and more stable internal funds to finance R&D projects. There may be scale economies in R&D. The returns from for example process innovation may be higher if the firms is producing large quantities. Finally, there may exist complementarities between R&D and other activities in the firm. However, there are also some counter-arguments, for example the loss of control in large organisations.

Since horizontal mergers increase the size of the merging firms and also the concentration in the relevant market, horizontal mergers may potentially create important efficiencies in promoting technological progress. Unfortunately we are not aware of any empirical studies that focus directly on the effects of merger on technological progress. However, there exists a large empirical literature that tests Schumpeter's two hypotheses: (1) innovation increases with firm size and (2) innovation increases with market concentration. This literature may be used as indirect evidence. However, one should point out that there are many methodological problems

in this work. For example, one fundamental problem is the absence of satisfactory measures of new knowledge and its contribution to technological progress. The main conclusion from this literature is that the effects of firm size and market concentration on innovation, if they exist at all, do not appear to be important (Cohen and Levin, 1989).[44]

2.3.3 Pass-on

In order to understand the welfare effects of a merger, it is not sufficient to know whether the merger creates any efficiency gains. It is also important to know if, for example, cost savings are passed on to consumers in the form of a lower price. This is important in order to assess the effect of a merger on the distribution of wealth in society. Pass-on is also important since it affects the dead-weight loss of a merger.

From an empirical perspective, pass-on studies appear in various applications. In international economics, for example, there exists a detailed literature estimating the effects of exchange rate changes on prices, see for example, Goldberg and Verboven (1998) and, for an overview, Goldberg and Knetter (1996). These studies show that foreign firms generally do not fully pass-through exchange rate changes into local consumer prices. Also in international economics, there are studies that analyse the effects of import tariffs on prices. Feenstra (1989), for example, finds a symmetric degree of incomplete pass-through of import tariffs as of exchange rate fluctuations, consistent with theory. In public economics, there exists an empirical literature on tax incidence, i.e. who bears the burden of value added taxes and excise taxes. Most of the traditional literature focuses on tax incidence under perfect competition. More recently, Verboven (1998) considered a model of imperfect competition for the car market, and found significant tax incidence stemming from imperfect competition. Finally, in agricultural economics there is a large literature on the incomplete transmission of raw goods prices into final consumers prices, see e.g. McCoriston, Morgan and Rayner (1998). The results from this literature should however be interpreted with care in the present context, since raw goods typically constitute only part of marginal costs. For an attempt to take this into account empirically, see for example Bettendorf and Verboven (1998).

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[44] However, there is some evidence that expectations that successful R&D may increase a firm's

The general empirical finding from this literature is that pass-on is indeed incomplete. The examples cited above suggest that pass-on roughly varies between 30% and 70%.[45] Chapter 4 contains a more detailed treatment of the question of pass-on. Yet we stress that more study is necessary to obtain a complete picture.

2.3.4 Summary and conclusions

In our view, the empirical picture on the effect of merger on productivity and technological progress is too incomplete to allow any far-reaching conclusions. The general picture remains. There does not exist clear evidence that mergers, as a general rule, create efficiency gains. However, at least some mergers do create efficiencies. Moreover, empirical evidence indicates that (between 30 and 70 percent of) costs savings are passed on to price.

To complement this picture we believe that it would be valuable with a follow-up study. Such a study should, in our view, focus on empirical estimates of returns to scale. Such studies can be used at least as indirect evidence for the efficiency gains from mergers. It would also be desirable to deepen the survey into pass-on. In both cases, it should be possible to obtain results for specific industries.

2.4 Distribution

The discussion above has primarily focused on the issue if mergers create any efficiency gains. However, we are also interested in how the social surplus (or losses) created by the merger is divided between the firms' different interest groups. Typically one would expect that a merger affect the wealth of all the interest groups, including suppliers, buyers, competitors, bondholders, employees and management. Actually, some of the studies reviewed above also have implications for the distribution of the social surplus created by the merger. In particular, two results are noteworthy.

First, studies of consumer prices (and the merging firms' market shares) indicate that horizontal mergers reduce consumers' welfare. Hence, if mergers create efficiency gains, consumers do not, at least as a general rule, receive a share of that surplus.[46]

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market power may motivate R&D efforts.

[45] That is if cost is reduced by ten percent, price is reduced by three to seven percent.

[46] Remember however that there are relatively few direct studies of how mergers affect consumer prices (and the market shares of the insiders).

Second, the event study evidence shows that the target firms' shareholders benefit, and that the bidding firms' shareholders generally break even.[47] The unequal distribution suggests that competition authorities may want to condition the approval of an *international* merger on whether the national firm is buying or being bought. In particular, the competition authorities may be more favourable towards a merger in which the national firm is being bought.[48] Also in national mergers the unequal distribution may have some consequences for distribution between wealth groups. The bidder is often the bigger and financially stronger party, and the target may be a smaller (perhaps family owned) firm.

Apart from the impact on consumers and shareholders, it may be of special interest to analyse the effects of mergers on employees. In particular, for policy-makers potential job-losses is an important issue. Unfortunately, not much useful empirical or theoretical work has been done to analyse what impact horizontal mergers, and the efficiency gains from such mergers, have on wages and employment. Therefore we confine ourselves to sketching what these effects may be.

The effect of mergers on employees is a complex issue. A purely anti-competitive merger reduces output and thus employment. A merger that creates some efficiency gains does so either because the assets in the two firms (including employees) are complementary in some sense, or because some duplicated functions can be eliminated. In the first case the marginal products of the employees are increased. In the short run, that could lead to higher wages. But in the longer run, when firm can hire more people, marginal productivity should be forced back to the level determined by the market wage rate. Thus the anti-competitive effect and the efficiency effect goes in opposite directions. The total effect, one may expect, goes in the same direction as output. That is, if the merger reduces output and increases consumers' prices, then employment is likely to be reduced. (A complication is that since productivity has increased, by

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[47] Remember however that the evidence only shows that mergers increase the aggregate stock value of the insiders relative to the pre-merger situation. This does not imply that the aggregate stock value after the merger is higher than it would have been in case of a strict merger control that would have prevented the merger. The reason is that the pre-merger stock value in the first case takes into account the probability that there will be a merger, while in the latter case the pre-merger value is formed under the knowledge that there will not be a merger (Fridolfsson and Stennek, 1999).

[48] In contrast, casual evidence suggests that many debaters are *less* favourable towards a merger in which a national firm is being bought. This may be due to a fear that the country will loose job opportunities, or to purely nationalistic reasons.

assumption, output change is an upward biased estimate of employment change.) Empirical results indicate that horizontal mergers, on average, reduce output. Hence, one may expect that horizontal mergers, on average, lead to reduced employment. In the second case, one would expect that the firms lay off some employees. In this case, the anti-competitive effect and the efficiency effect both points at reduced employment.[49]

We thus conclude that horizontal mergers, on average, may be expected to reduce employment in the merging firms. At the same time, one should note, competitors to the merging firms are likely to expand their output (if the merger increases consumers' prices). Hence, the first effect is likely to be mitigated by this response. Still, however, the first effect may be likely to dominate. Now, if employment is reduced, we need to know where these former employees go. If there is no unemployment (or only unemployment due to frictions), they will soon get a new job at a similar wage. However, if there is unemployment, the laid off workers may be hurt in a very significant way by the merger.

The above discussion has presupposed that wages are set by the market, and that the firms only adjust employment as a result of the merger. However, if wages are truly negotiated, and if the employees have bargaining power in wage negotiations, the analysis becomes more complicated. In this case, one may expect that the surplus that the firms gain from having market power in the final goods markets, to some extent is transferred to the employees. A merger that increases market power thus has the potential to increase wages to those that remain employed in the firms. (Another way for employees to extract these rents is to negotiate less lay-offs.) On the other hand, the merger may increase the firms' market power in the labour market (buying power). Hence, the effect on wages is ambiguous. There is a larger surplus to bargain over, but the firms' have increased their bargaining power. Much of the empirical evidence seem to support the hypothesis the employer bargaining strength hypothesis (Hekmat, 1995;

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[49] This discussion shows that efficiencies are likely to be important for how a merger affects employment in the merging firms. However, the effect of efficiencies (abstracting from the anti-competitive effect) is to increase employment in one case (complementary assets), and to reduce employment in the other case (elimination of duplicated functions).

Gokhale, Growhen and Neumark, 1995; Becker, 1995; Peoples, Hekmat and Moini, 1993). Some evidence points in the opposite direction (Kole and Lehn, 1997)[50]

3. A "CHECK-LIST"

On the basis of a review of the efficiency defences in seven O.E.C.D. merger control systems, we now synthesise the discussion to produce a "check-list" covering the important dimensions that must be considered in order to design a control system that takes efficiencies into account. We should emphasise that the main purpose of this part of the chapter is to identify the important dimensions, and to *illustrate* them with examples from the practice of competition authorities. The purpose is not to describe what every competition authority is doing in every dimension.

The discussion also includes some preliminary economic analysis. We often refer to what competition authorities "should do" if they aim for a full cost-benefit analysis of the merger.

Our discussion is often phrased in terms of cost savings, however that should only be viewed as an example of efficiencies in general.

4.1 Objectives

Any merger control system is, at least implicitly, based on some welfare considerations. A merger affects the well-being of many individuals. In fact, any person that belongs to at least one of the firms' interest groups (consumers, share-holders, management, workers, suppliers, creditors, and also competitors) is likely to be affected. The purpose of an explicit welfare standard is to indicate which of these effects are to be taken into account by competition authorities, and how one is to weigh the positive effects for some individuals against the negative effects for other individuals. If a complete cost-benefit analysis is to be made, all effects must be considered, and added to a social net effect. Furthermore, if the policy maker is concerned with the distribution of wealth in society, the effect on each individual should be given a weight

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[50]   Moreover, one may argue that hostile takeovers are likely to be triggered in those cases where the current management has negotiated wage contracts that are too generous. The take-over gain would then consist in renegotiations of these contracts. In that case, employees are hurt by the transaction. However, in order for that mechanism to work, it must be that the new management is more skilled in wage negotiations. Empirical studies find little evidence that

corresponding to that individual's position in the wealth distribution.[51] In practice, however, competition authorities analyse the effects of a merger at the level of interest groups, and not at the level of individuals. Moreover, they do not include all interest groups in the analysis.

1. Welfare Standard. All competition authorities analyse the effects of a merger on two interest groups, namely consumers and share-holders.[52] At least four different welfare standards have been used (or discussed) in different jurisdictions to weigh consumers' interests against share-holders' interests.

i. *Total surplus (or Williamson's) standard.* According to this standard a merger should be allowed if it creates more wealth to producers than it destroys for consumers. Hence, distribution does not matter. It should be emphasised that according to this standard also a merger that raises the price may be approved.

ii. *Consumer's surplus (or price) standard.* According to this standard a proposed merger should be allowed if and only if consumers gain. The reason to adopt this standard is if one is concerned with distribution, and if consumers in general are poorer than the owners of the firms.

iii. *Hillsdown standard.* According to this standard, efficiencies must exceed the losses to consumers. It can be shown that this standard is stricter than the total surplus standard, but more allowing than the price standard. Expressed differently, this means that there are distributional concerns, but not as strong as in the consumer's surplus standard.

iv. *Killer standard.* According to this standard, a merger should be allowed only if all efficiencies are passed on to consumers. This standard is built on very strong distributional concerns.

One may rank these standards according to the strength of distributional concerns: total surplus (distribution does not matter), Hillsdown, consumer's surplus,

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takeovers are motivated by the expropriation of extra-marginal wages (Gokhale, Growhen and Neumark, 1995; Neumark and Sharpe, 1996).

[51]   See our discussion in the Theory section.

[52]   In some jurisdictions also other groups' (apart from consumers and shareholders) interests are taken into account. In some jurisdictions, it is explicitly stated that also the effects on workers is included (E.U.), while in other jurisdictions it is explicitly said that for example unemployment risks should not be considered (Sweden). In some jurisdictions (U.S.) the effect of merger on small competitors is taken into account.

killer (distribution very important). The total surplus standard is articulated in the Canadian merger guidelines[53]. However, in *Hillsdown* this interpretation of the Canadian competition Act was questioned by the Court. According to McFetridge (1998), a reasonable interpretation of the Court's decision is a "new" standard – called *Hillsdown* above. The US merger guidelines apply the consumers' surplus standard. It appears that the Courts in Sweden employ the total surplus standard, while the Swedish competition authority applies the consumers' surplus standard.

The choice of welfare standard affects how often an efficiency defence can be expected to be used. For example, in the USA (consumer's surplus standard) there are numerous cases where efficiencies have been an issue. However, also the US choice of fairly strict concentration thresholds matters. In the EU, that looks for dominance, many of these mergers would not be contested in the first place. Those that would be contested would require large cost savings to meet a consumers' surplus standard (cf. McFetridge, 1998, p. 52). The killer standard is only applicable when the market is perfectly competitive anyway. Hence, with the killer standard an efficiency defence would never be used.

2. International Competitiveness. In international markets the welfare trade-offs are somewhat different from the welfare trade-offs made in national markets. There are two reasons for this. First, in a market where mainly national firms sell to mainly foreign consumers, an anti-competitive merger enhances national welfare, even if there are strong distributional concerns (within the country). Second, in a market where national firms compete with foreign firms, a merger of national firms that leads to substantial cost-savings, enhances the national firms' competitiveness. In some jurisdictions, the international competitiveness[54] of the domestic firms is considered an objective for the merger control.

The Canadian Competition Act stipulates that, in the determination of whether a merger is likely to bring about gains in efficiency, account should be taken of whether such gains will result in: (i) a significant increase in the real value of exports or (ii) a significant substitution of domestic products for imported products. In France the

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[53]   Editor's note: Since this study was carried out, the section on efficiencies in the Canadian merger guidelines is no longer valid as a consequence of the Propane judgement (see Chapter 2). The Competition Bureau launched a consultation on new draft guidelines in March 2004.

[54]   For terminological simplicity we let international competitiveness refer to both the international aspects mentioned.

efficiency defence explicitly states that, in addition to economic progress, a contribution to international competitiveness is considered a part of the efficiency defence. In the UK[55] and in Sweden also international competitiveness is an objective for merger control. In the USA, on the other hand, international competitiveness is not considered.

Although related, international competitiveness is a distinct policy objective from productive efficiency (cost-savings). For analytical clarity it may be convenient to treat them separately.

3. Future Viability. Cost savings may also be necessary for the merging firms to survive in the long run. An example of such a situation is if there are important returns to scale, and if the merging firms are small in comparison to their competitors. Such considerations are made in Sweden. Taking the firms' future viability into account, as a part of an efficiency defence, is not necessary if the merger control includes a failing firm defence.[56]

4. Inefficiencies. In some cases the competition authorities suspect that a merger will produce net inefficiencies rather than net efficiencies. Our review of the empirical and the theoretical literature has shown that such mergers do occur. The question is then, should competition authorities condemn a merger based *inter alia* on the argument that the merger creates inefficiencies. Expressed differently, should competition policy be used as a means to eliminate mergers that reduce firms' internal efficiency. Merger control in the UK includes such a possibility[57].

4.2 Identification and Measurement of Efficiencies

5. Types of efficiencies. An efficiency defence must state what types of efficiencies are included. If a complete cost-benefit analysis is to be made, any social efficiency that the merger generates should be included. Efficiencies may come in the form of cost savings, improved quality, or improved services. Cost savings, in turn,

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[55]   Editor's note: Since the entry into force of the Enterprise Act 2002, international competitiveness no longer figures among the criteria applied in merger control in the UK.

[56]   In that case, competition authorities can simply wait to approve the merger until at least one of the firms is starting to lose money. On the other hand, if it is clear at an early stage that the firms are not viable as separate entities, then a quick merger might be preferred since that would reduce uncertainty for the firms' interest groups. This, however, seems to be an issue for the proper design of the failing firm defence.

may stem from rationalisation, or scale economies, or technological progress, and so on.

In this section we discuss six forms of restrictions that competition authorities, nevertheless, may put on what types of efficiencies they consider.

1. *Redistributive (or pecuniary) gains.* It is important to distinguish between true social efficiencies and redistributive gains. This is, for example, done in a clear way in the Canadian merger guidelines[58]. Only the first category should be included in an efficiency defence. For example, cost savings should only be included if they represent a saving of resources. If firms save on costs because the merger increases their bargaining power and enables the merged entity to extract wage concessions, or discounts from suppliers (not corresponding to cost savings), that is only a wealth transfer and it should not be counted as a social efficiency. Another example is tax gains.[59]

2. *Quantity reductions.* Another issue concerns cost savings that stem from an anti-competitive reduction in quantity. In a complete cost-benefit analysis, such cost savings should be considered. Of course, they should be balanced against the reduction of consumers' surplus, and if these are the only cost-savings they will never suffice to make the merger socially desirable. But the point remains, they should be counted as a cost saving. However, there are two different ways to do this. One way is to include these cost savings in the "stage-one" analysis that attempts to compute the dead-weight loss due to the merger. If that is done, these cost savings should not be counted once again in the efficiency defence. The other way is to exclude these cost savings from the first stage, and to include them instead in the efficiency defence.[60]

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57   Editor's note: Since the entry into force of the Enterprise Act 2002, the UK authorities can no longer prohibit a merger on the sole ground that it creates inefficiency.

58   See footnote 55.

59   If competition authorities use a consumers' surplus standard this issue is not entirely clear. Also reductions in the firms' costs that originate from redistribution (e.g. tax gains) do benefit consumers.

60   It appears that the first method is used in the U.S. However, in the merger guidelines it is only stated that these cost savings are not included in the efficiency defence. It is not explicitly stated that they are considered in the first stage.

3. *Fixed costs.* If competition authorities use a consumers' surplus standard, only savings in variable costs are normally to be considered. This means that some types of efficiencies, e.g. duplication of administrative routines, usually do not need to be discussed, since they do not usually affect variable costs.

4. *Other markets.* Another subtle issue is cost savings (or other efficiencies) that are realised in other markets. On one hand, one may argue, that it does not matter where the saving of resources occur. In a complete cost-benefit analysis, these savings should be included. This view is taken in the Canadian merger guidelines[61]. However, there are at least two arguments against this view. First, if competition authorities need to study the effect of the merger on more markets (than the so-called relevant market), the analysis would be more complex and hence costly. Moreover, if cost-savings in other markets are included one may argue that also other issues related to these other markets should be addressed by the competition authorities.[62] Second, including efficiencies in other markets makes it necessary to weigh the gains for consumers in those other markets against the losses for consumers in the market where competition is harmed. In the U.S. case Lucy Lee/Doctors Regional Medical Center, the court held that pro-competitive effects in one market could not justify anti-competitive effects in a different market. In Germany and the UK, on the other hand, the competition authorities balance anti-competitive effects in one market against pro-competitive effects in other markets.

5. *Industry level efficiencies.* Another issue concerns the distinction between efficiencies at the level of the merging firms and efficiencies at the level of the market. An example of the efficiencies at the level of the merging firms could be cost savings as a result of specialisation between the plants that are owned by the merged entity. An example of efficiencies at the level of

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[61]   See footnote 55.

[62]   Today competition agencies focus attention on the effects of the merger on the so-called relevant markets (the market where competition is harmed). A reduction in competition is normally believed to produce dead-weight losses (allocative inefficiencies). However, from an economic perspective this is a very partial analysis. In particular, according to the theory of second-best, a reduction of competition in one market may actually be beneficial for allocative efficiency, if competition is already low in markets for

the industry is that the merger between two firms may affect the R&D incentives for the competitors (see sub-section 1.1.3). It appears that U.S. and Canadian efficiency considerations only refer to firm-level efficiencies, while Swedish efficiency considerations, in principle but perhaps not in practice, include both types.[63] A possible reason why only firm-level efficiencies are considered is that they are easier to verify. Even if both types are considered, one may argue that market-level efficiencies should be treated separately, at least in assigning the burden of proof. The reason is that it is probably only concerning the firm-level efficiencies that the firms are (much) better informed than the competition authorities.

6. *Problem of proof.* In practice some efficiencies are more difficult to verify. Some competition authorities have chosen to state explicitly which types of efficiencies are less likely to be considered due to such problems (see below).

6. Net effects. An efficiency defence may take into account retooling and other costs that must be incurred to achieve efficiency gains, and deduct them from the total value of the efficiencies - computing the net efficiency. That is done in the USA, Canada and Sweden. Note, however, that if these costs only affect fixed costs, they will not be passed on to consumers. Hence, including these costs is not important if competition agencies use a consumer's surplus standard.

7. Measurement. In some jurisdictions it is explicitly indicated what firms should prove, and what kind of documentation they should use.

In the US merger guidelines it is said that the merging firms must substantiate efficiency claims so that the agencies can verify (1) the likelihood and magnitude of each asserted efficiency, (2) how and when each would be achieved (and any costs of doing so), (3) how each would enhance the merged firm's ability and incentive to compete, and (4) why each would be merger-specific.

In the Canadian merger guidelines[64] it is said that objective verification of particular sources of efficiency gains may be provided by (1) plant and firm-level

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close substitutes. If competition authorities would include efficiencies in other markets, one may argue that they also should also take into account second-best considerations.

[63]   The threshold criteria proposed by Farrell and Shapiro do take some external efficiencies (reallocation of production between merging and non-merging firms) into account.

[64]   See footnote 55.

accounting statements, (2) internal studies, (3) strategic plans, (4) capital appropriation requests, (5) management consultant studies (where available) or (6) other available data.

8. Merger specificity. In some jurisdictions, it is argued that an anti-competitive merger should only be approved because of the efficiencies that it creates, if those efficiencies *would not* be realised through less anti-competitive means.

It may be difficult for competition authorities to judge what alternatives should be considered. For this reason it is explicitly stated in the Canadian merger guidelines[65] that only if the other means is a common industry practice will it be considered. Examples of alternatives are: internal growth; a merger with an identified third party; a joint venture; a specialisation agreement; or a licensing, lease or other contractual arrangement.

Note that the "merger-specificity" requirement entails that an efficiency defence is invoked only if the anti-competitive concerns cannot be resolved through divestiture or other remedies.

9. Discounting. In the Canadian merger guidelines[66] it is explicitly stated that to compare efficiencies and anti-competitive effects that occur at different points in time, one needs to remove the effects of anticipated future inflation, and apply a standard real discount rate.

4.3 Analysis of Competition

In this section we discuss how to analyse the linkage between efficiency gains and competition.

10. Mode of competition. Already an analysis of the effect of a merger on competition (assuming that there are no cost savings) requires that competition authorities have information about the mode of competition in the market. The analysis of the effect of cost savings brought about by the merger also depends on the mode of competition.

There are several issues involved. The first issue concerns whether the firms on the market compete or whether they collude. In the US merger guidelines the first possibility is discussed under the heading "unilateral effects" and the second under the heading "co-ordinated effects." Second, if firms compete, analysis of oligopolistic

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[65]   See footnote 55.

interaction can be performed either according to the Bertrand model or the Cournot model (see the Theory part). In the USA it appears that the agencies use the Cournot model for homogenous goods markets, and the Bertrand model for differentiated products. Third, in some markets (typically markets for intermediate goods) the buyers (or sellers, if the merging firms are buyers) also have market power. In that case, the analysis needs to take countervailing power into account.

11. Efficiencies as an offence (anti-competitive effects). Cost savings are per se desirable. However, cost savings can have negative side effects. In particular, if two firms merge and thereby lower their variable costs, they become a tougher competitor. Actually, if the cost reduction is big enough, the merger may imply that competitors are driven out of the market, or that new entry is blocked. In this sense, cost savings may be anti-competitive. In a complete cost-benefit analysis such anti-competitive effects should be included in the analysis of a merger, and there is no inconsistency if efficiencies are treated both as an offence and as a defence. Cost savings have been treated as an offence both in the USA (*Brown shoe*) and in the E.U. (*MSG Media Service*).

The fact that cost savings may have anti-competitive effects may complicate the analysis. It means that the analysis of the merger's anti-competitive effects cannot be completely separated from an analysis of the merger's effect on costs. That is, a preliminary analysis of the effect of the merger on competition, based on the assumption that costs are not affected, may underestimate the true anti-competitive effects of the merger. If a merger is cleared at this stage, before cost savings have been estimated, there is a risk that mergers that should have been blocked are never detected as anti-competitive.

12. Pass-on (pro-competitive effects). Competition authorities do not only need to assess the existence and magnitude of efficiencies. They also need to assess the extent to which the cost savings are passed on to consumers.[67]

In a non-collusive market (unilateral effects), four issues are important for assessing pass-on. *First*, it is necessary to distinguish between variable and fixed costs. Only reductions in variable costs are (directly) passed through to consumers. *Second*, it

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[66]   See footnote 55.
[67]   This is important to assess the effect of merger on consumers. It is also important in a Williamsonian trade-off since the pass-on affects the size of the dead-weight loss.

is necessary to estimate the degree of post merger competition. The more competition there is ex post, the more the cost savings will be passed on to consumers. For example, if competition is very intense, a reduction of marginal cost by €1 would lead to a reduction of the price by €1. If the merger creates a monopoly (and if demand is very price insensitive) the price may essentially be unaffected by the cost savings. *Third*, pass-on also depends on the exact "shape" of the demand function. In particular, if the price elasticity of demand is higher at higher price levels, then the effect of a reduction in cost on price tends to be small (everything else equal). *Fourth*, the slope of the marginal cost function also affects pass-on.

In a collusive market, all three aspects mentioned above are still crucial. In order to estimate the degree of post merger competition, it is also necessary to estimate the degree of post merger collusion. The more collusion there is, the less a given reduction in cost will be passed on to consumers (much like the non-collusive case). It may be more difficult to assess the effect of efficiencies on the price level in a collusive market. The reason is that cost savings may reduce the likelihood that collusion is successful.[68] However, economic theory is not well developed to analyse these issues.

In one US case (Long Island Jewish Medical/North Shore Health) pass-on was considered likely since the merging parties where not-for-profit organisations.

4.4 Informational Aspects

In this section we discuss issues related to the fact that competition authorities have little (in particular, less than the firms) information concerning the efficiency gains from mergers.

13. General-presumptions versus case-by-case methodology. Essentially all horizontal mergers increase market power and reduce allocative efficiency. If this was the only effect of horizontal mergers, a general prohibition against horizontal mergers would be the natural policy. However, mergers also lead to cost-savings and other

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[68]   This view is expressed in the U.S. merger guidelines. It is said that marginal cost reductions may make co-ordination less likely or effective by enhancing the incentive of a maverick to lower prices or by creating a new maverick firm. These ideas are more elaborated in an FTC Staff Report (1997). It is said that lowered costs may disrupt market conditions so as to make collusion less likely or to disturb the terms by which firms previously were able to co-ordinate conduct. Likewise, if merger-related efficiencies eliminated a technology disadvantage, the merged firm might become a more significant constraint on market leaders.

efficiencies. There are two main methods by which efficiencies are balanced against the reductions in allocative efficiency in merger control today:

i. *The general-presumptions method:* Not all horizontal mergers are prohibited. Typically, only those mergers that significantly reduce competition may be challenged. For mergers that only reduce competition insignificantly (according to some indicator such as the Herfindahl measure of concentration or the merging firms' market shares), cost-savings are presumed to be more important than the anti-competitive effects. The global method is used in by the Bundeskartellamt in Germany. According to some, including the E.U. Commission, the global method is used in the E.U. merger control.

ii. *The case-by-case method*: Efficiencies may be balanced against anti-competitive effects on a case-by-case basis (efficiency defence). Elements of the case-by-case method is used in the USA, Canada, France, UK and Sweden.

The main argument in favour of the global method is that the case-by-case method requires much information and hence may be costly, or even impossible, to implement. Against this argument one may say that the global method only produces a reasonable outcome if the indicators (e.g. such as the Herfindahl measure of concentration or the merging firms' market shares) that are used to indirectly assess anti-competitive effects are reliable and if the threshold is set in a reasonable way. This also requires information. The type of information needed is, however, different. It is not necessary to collect data about the proposed mergers. It is sufficient to use statistical information, for example from economic research. Unfortunately, as we have already argued, there is not much such information.

Typically, case-by-case considerations of efficiency gains are combined with some general presumptions about the effect of merger on efficiency. This intermediary form may be called the sequential method.

iii. *The sequential method:* For mergers that only reduce competition insignificantly, cost-savings are presumed to be more important than the anti-competitive effects. Case-by-case considerations of efficiencies are initiated as a second step, in case the analysis of a first step suggests that

the proposed merger causes non-negligible concern for anti-competitive effects.

Symmetrically, one may use general presumptions to define a level above which anti-competitive effects are presumed to dominate (and case-by-case analysis is not allowed). In case both a high and a low threshold are defined, case-by-case considerations are allowed only in intermediate (or perhaps marginal) cases. For example, according to the US merger guidelines efficiencies almost never justify a merger to monopoly or near-monopoly. Similarly, according to Article 81(3) of the Treaty of Rome, an anti-competitive agreement cannot be exempted if the agreement gives the firms the possibility of eliminating competition in respect of a substantial part of the products in question.

The motive for the two-step procedure is that efficiencies are difficult to evaluate. The two-step procedure means that efficiencies need only be assessed in those cases where the anti-competitive effects are neither negligible nor very strong.

However, there is a potential risk with such a procedure. Since efficiencies may have anti-competitive effects, those effects may not be noted (see the discussion about efficiency offence above). Naturally, if the thresholds are strict, this problem is less important.

14. Burden of Proof. The key problem with an efficiency defence is information. In many jurisdictions, it is the firms that have the burden of proving that a merger (already found to be anti-competitive) produces sufficient efficiencies not to be blocked. This is the case in the USA and Canada, and in the EU concerning exemptions for agreements that restrict competition. A likely reason for this is that it is the firms that have the best information.

In some jurisdictions it is explicitly indicated what firms should prove, and what kind of documentation they should use (see above).

Nevertheless, even with such clarifications, lack of information remains as the key problem with an efficiency defence. For example, Kinne (1998) argues that it is the problem of proofs that is the principal reason why courts in the USA have repeatedly rejected efficiency claims.

15. Standard of Proof. Whenever decisions are to be based on evidence, one of the fundamental questions is what standard of proof to require. As it is difficult to

predict efficiencies precisely before a merger is consummated, one should rather talk about a persuasion standard. But the question remains, for an efficiencies defence, should one require that the cost savings be possible, probable, or virtually certain? In the U.S. the standard has changed over time, from requiring "clear and convincing evidence" to requiring that claims are "credible" or "clearly demonstrated."[69]

16. Full versus Partial Defence. In practice some efficiency gains are more difficult to verify. Some competition authorities have chosen to explicitly state which types of efficiencies that are less likely to be considered due to such problems. That may help to clarify the standard of proof that is used, and it may save time for both firms and the competition agency.[70]

According to the U.S. Merger Guidelines: Efficiencies resulting from *rationalisation and multi-plant economies of scale*, that is shifting production among facilities formerly owned separately, which enable the merging firms to reduce the marginal cost of production, are more likely to be susceptible to verification. Efficiencies relating to *research and development* are potentially substantial but are generally less susceptible to verification.

The Canadian Guidelines[71] use two broad classes of efficiency gains: production efficiencies and dynamic efficiencies. Production efficiencies are generally the focus of the evaluation, because they can be quantifiably measured, objectively ascertained, and supported by engineering, accounting or other data. Dynamic efficiencies, include gains attained through the optimal introduction of new products, the development of more efficient productive processes, and the improvement of product quality and service. However, claims that a merger will lead to dynamic efficiencies are ordinarily extremely difficult to measure. Accordingly, the weight given to claims regarding such efficiencies will generally be qualitative in nature.

4.5 Other Procedural Aspects

17. Prosecutorial discretion versus Litigation. Efficiencies may be considered either by the competition agencies, or by the courts, or by both.[72]

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[69]   See Kinne (1988).
[70]   See also Fisher and Lande (1983).
[71]   See footnote 55.
[72]   See Fisher and Lande (1983).

18. Rebuttal versus Defence. There are at least two different ways that one may *frame* an efficiency justification for a merger, namely as rebuttal or as defence. The difference between the two frames originates from the fact that the term "competition" can be used in two different meanings.

i. According to one definition, the degree of competition is measured by the price level (or perhaps consumers' satisfaction). Using this definition, horizontal mergers can be both pro-competitive (those that reduce price), and anti-competitive (those that increase price).

ii. According to another definition, the term "competition" refers to the degree of market power. Market power may be measured by the price to cost mark-up that firms charge. With this definition, all horizontal mergers reduce competition (i.e. increase mark-ups) at least slightly,[73] and some of them significantly reduce competition.

Merger control forbids mergers that reduce competition (significantly). The exact meaning of this prohibition depends on which of the two meanings that one gives the term "competition." Consider a merger that increases mark-ups significantly, but reduces price (due to large counteracting cost savings). Since mark-ups are increased, such a merger would be blocked using the second interpretation of the term "competition." Since price is reduced, such a merger would be permitted using the first interpretation of the term "competition."

Furthermore, depending on the interpretation of the term "competition," an efficiency justification of a merger must be framed differently. If competition refers to the price level, a merger should be blocked if, and only if, it raises the price (significantly). With this definition one may justify a horizontal merger by rebutting a claim that it reduces competition.

i. Rebuttal: Because of the efficiencies, the merger does not lessen competition (it does not increase price), and should be allowed.

In contrast, if competition refers to the degree of market power (mark-up), almost all horizontal mergers reduce competition, and are consequently hit by the

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[73] There are a few "theoretical" reasons for why a horizontal merger would not reduce competition, such as if the merger triggers immediate entry, or if one of the firms is failing, or if the firms colluded perfectly before the merger.

prohibition. With this definition rebuttal is not available.[74] Instead, one may express the justification of a horizontal merger as an efficiency defence.

    ii.   Defence: The merger lessens competition (it increases mark-ups). However, due to the efficiencies, it is nevertheless desirable, and should be allowed.

As we see it, the difference between the two frames is only a difference in terminology.[75]

It seems that there has been a drift away from the defence-frame to the rebuttal-frame in the 1997 revision of the U.S. 1992 merger guidelines.[76] It also seems that the rebuttal frame was used in the landmark case *FTC v University Health* (see above). It is not possible for us to say if there has been any related change in the substance (for example that pass-on to consumers is considered more important now, or that the timing of the analysis has changed[77]). One may speculate that such a change in terminology may make it easier to re-conciliate the Supreme Court case law (negative to efficiency justifications of mergers) with FTC-DOJ policy and the emerging lower court case law (more favourable to efficiencies).

Actually, the rebuttal-frame may also provide a more convenient setting than the defence-frame for efficiency justifications under the EU Merger Regulation (see 5.4.2.1).[78]

19. Merger guidelines/Notices. Several competition agencies, notably in Canada and the USA,[79] have chosen to publish the way they analyse mergers, including the way efficiencies are considered. In Europe, the Commission has published Notices concerning certain aspects of its analysis, e.g. market delineation. If the firms have the burden of proving the existence of efficiencies, such merger guidelines may help the

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[74]   Of course, the merger may not raise the mark-up *significantly*. In that case, a rebuttal is available. However, it is unlikely that the small increase in mark-ups is due to cost savings. It is more likely that a modest increase in mark-up is due to intense ex post competition.

[75]   However, the rebuttal frame is only convenient if the welfare standard is a price standard.

[76]   See FTC Staff report (1997).

[77]   The rebuttal-frame may provoke that efficiencies are considered earlier in the process, and not as a second stage. However, as we see it, the issue of timing and the issue of frame may be decided separately.

[78]   For convenience, we have phrased our discussion in terms of an efficiency defence and not as a rebuttal.

[79]   Merger guidelines are also on their way in Sweden. (Editor's note: The section on efficiencies in the Canadian guidelines has been disapplied – see footnote 55.)

firms, the competition agencies and the Courts. Apart from reducing the firms' uncertainty, it may help them to focus on the relevant matters.

4. A FRAMEWORK FOR MERGER ANALYSIS

The previous parts of the chapter discussed theoretical aspects, empirical evidence and current practices concerning the treatment of efficiencies from mergers. This part aims to bring the threads together and propose a framework that may be used in incorporating efficiencies into merger analysis. Broadly speaking, three approaches may be distinguished. The case-by-case approach explicitly analyses the magnitude and effects of efficiencies in every merger case. The general presumption approach makes use of general structural indicators (such as market shares) with an implicit recognition on the existence of average efficiencies in mergers. The first approach has the potential problem of high information costs in measuring efficiencies and their effects. The second approach has the potential problem that there is a lot of aggregate uncertainty concerning efficiencies from mergers, in which case the structural indicators are not perfect predictors of the net benefits from mergers.

A third approach is the "sequential" approach, which aims to combine the relative advantages of both extremes by minimising on both information costs and errors that may arise from the unreliability of structural indicators. In a first step, structural indicators are used to arrive at an initial decision. In a second step, an "efficiency defence"[80] with a more detailed investigation may be allowed.[81]

Section 4.1 of this chapter reviews in detail the various approaches to incorporate efficiencies. Based on our conclusions from the empirical literature that efficiencies may need to be assessed on a case-by-case basis, we construct an information-economising framework for evaluating mergers. In a first stage, notified mergers are assessed using routine tools with modest information requirements. Mergers that do not pass the first stage test are subject to further investigation, including an efficiency defence. We note that the transition from a general

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[80]   Unless we explicitly say so, we use the term "efficiency defence" to also include "rebuttal" (see the check-list) in this chapter.

[81]   In practice, sequential decision making may occur in more than two step, to consider various dimensions of the merger effects in detail. These steps may include a market share test, an entry barrier test, a failing firm test and an efficiency test. In our discussion here, we abstract from issues related to for example entry and failing firms.

presumptions approach (where explicit efficiency arguments are ruled out) to a sequential approach with explicit efficiency considerations for some mergers, does not imply a more lax policy towards mergers. Generally speaking, such a transition does require a revision of the currently used threshold criteria. Rather than a single "dominance" threshold level, delineating acceptable from unacceptable mergers, two thresholds levels are now required: a first threshold to delineate automatically acceptable mergers from those subject to an efficiency defence; and a second threshold to delineate the mergers subject to an efficiency defence from those that are automatically unacceptable. The first threshold typically lies below the currently used "dominance" threshold level, whereas the second threshold level would lie above the current level.

Sections 4.2 and 4.3 go into more detail in informational aspects that need to be addressed if one decides to incorporate an efficiency defence in merger evaluation. This analysis is partly based on our theoretical findings and partly based on the practice in O.E.C.D. countries. We focus on the implementation of an efficiency defence assuming that the merger authority has a price standard, rather than a total welfare standard. We emphasise that there are two essential components to the analysis of efficiencies: the calculation of minimum required efficiencies or MREs (section 4.2), i.e. efficiencies required to compensate for market power effects; and the measurement and verification of actual efficiencies (section 4.3.). An efficiency investigation should explicitly balance these two components in an as transparent way as possible.

The calculation of minimum required efficiencies (MREs) requires essentially an assessment of the likely expected market power (or anti-competitive) effects. The difficult task for the merger authorities is to obtain a good idea of the nature of competitive interaction before and after the merger. This is not an obvious task, given the various possible models of competition as shown in the theoretical part. To resolve this problem, we propose that the merger authorities focus on calculating the MREs in a worst case scenario about anti-competitive effects. We provide a simple methodology to implement this idea, which essentially only requires information on the expected degree of pass-on of cost changes into consumer prices. Our worst-case-scenario approach may yield too high efficiency standards for the merging firms. We therefore also provide formulae for MREs based on specific and simple models of competition, requiring information on market shares, concentration and price

elasticities; in addition we outline the simulation approach for computing MREs in more complicated models of competition. Nevertheless, these alternative procedures require a considerably more complex investigation (including robustness analysis) than our proposed simple worst-case-scenario approach. For this reason, it seems desirable to place the burden of proof on the merging firms when these more complex techniques are used.

The computed MREs may then be confronted with the actual expected efficiencies involved in the mergers. To measure actual efficiencies in a direct way, it is important to assess the various types of efficiencies, since not all types will have the same effects. Given the verifiability issues, it would be desirable to put the burden of proof regarding the types and the magnitude of expected efficiencies on the merging firms, who should follow procedures set out by the merger authority.

Section 4.4 synthesises the discussion and provides informational arguments in favour and against the efficiency defence. Also political arguments are considered. Finally, section 4.4 provides some directions on what needs to be done to incorporate the possible presence of efficiencies. In order to improve merger policy regarding the account of efficiencies, various concrete actions seem worth to consider. First, it would be important to think carefully about Art. 2(1)(b) of the Merger Regulation. Either a reinterpretation of this article or a modification would be desirable to recognise the potential role of efficiencies, without outlining how effiiciency considerations should be taken into account. A separate Notice (similar to "Guidelines") could then be published in which more detailed procedures are formulated on how efficiencies are to be treated in the evaluation of mergers. Finally, we argue that it would be desirable to systematically perform post-merger evaluation, which could, for example, include an analysis into actually realised efficiencies from mergers, and their pass-on to consumers.

4.1 The treatment of efficiencies

The purpose of this section is to provide possible alternative approaches to the treatment of efficiencies in merger analysis. The central problem for the merger authorities is to economise on information costs, without relying too heavily on indicators of expected net benefits in circumstances where these are unreliable.

4.1.1 Merger decision-making and types of errors

By its very nature, merger policy offers only a limited set of choices to influence competition. The competition authority either accepts the merger, rejects it, or, as a compromise, accepts the merger conditional on certain requirements such as divestiture. The limited, discrete set of alternatives in merger policy is in stark contrast with regulation, where a larger and more flexible set of policy instruments is available to influence competition. The regulation of prices, for example, allows for an infinite number of alternatives.

Whatever the goals of merger policy are (to protect consumer interests, international competitiveness, or total surplus), the merger authority faces the tremendous task of computing the net effects of a merger, by comparing the effects on market power with the effects on various types of efficiencies. The empirical evidence in Part 3 indicates that even for firms it may not be an obvious task to compute their net private benefits from merger. The task for the merger authority is even larger, since they have considerably less knowledge regarding the markets in which the firms operate.

Given the difficulties in computing the net effects of a merger, and given the limited set of alternatives available to the competition authority, one may distinguish between two types of error:

- Type 1 error: Accept a merger that has net harmful effects.
- Type 2 error: Reject a merger that has net beneficial effects.

The challenge is to design and apply a policy that minimises the *consequences* of the two types of errors. This does not mean that it is necessary to minimise the number of errors *per se*. Rather, it means that a good policy should minimise type 1 errors in those cases where significant net harmful effects are likely; and minimise type 2 errors in those cases where significant net beneficial effects are likely. At the same time, it is necessary to economise on information costs.

4.1.2 Alternative approaches

4.1.2.1 The case-by-case approach

A first way to analyse the net effects of mergers, including both market power and efficiencies, is to simultaneously consider all factors for each individual merger that is proposed. Such a case-by-case approach explicitly recognises the possible presence of efficiencies in every single case. One cannot speak, however, of an efficiency defence, since efficiencies are considered in the merger analysis in a fully integrated way. A case-by-case approach would, in principle, allow one to keep type 1 and type 2 errors at a minimum, at least to the extent that the investigation is successful without any unforeseen contingencies.

In practice, however, a case-by-case approach entails tremendous information costs. Broadly speaking, there are two types of information gathering activities: information gathering regarding market power effects, and information gathering regarding efficiencies. First, it is necessary to quantify the market power effects associated with the merger. We will introduce the concept of minimum required efficiencies (MRE), i.e. the amount of efficiencies necessary to compensate for the market power (or anti-competitive) effects of the merger. In principle, this requires a good understanding of the nature and the degree of competitive interaction in the industry. However, we will propose a tractable and general procedure which requires that the merger authorities focus on a "worst case scenario", which does not require the anti-trust authority to make specific behavioural assumptions.

Second, it is necessary to identify and measure the actual efficiencies that will be realised. Both types of information gathering activities may involve significant costs if there is a lot of uncertainty associated to future effects. Furthermore, the merging parties are likely to be in a better position to assess certain aspects of the merger effects than the merger authorities. Problems of information costs are discussed in detail in sub-sections 4.1.2 and 4.1.3.

4.1.2.2 The general presumptions approach

An alternative approach to evaluate mergers and incorporate efficiencies is by relying on general presumptions about their likely effects. An extreme example would be to forbid all horizontal mergers (net effects are presumed to be negative) or to allow all

mergers (net effects are presumed to be positive). A better variant, however, is to make the approval contingent on some easily observable indicators that contain some (but imperfect) information about the likely net effects of the merger. In particular, based on past experience regarding the types, the magnitude and the effects of efficiencies associated with mergers, one may construct structural indicators, such as market shares or concentration indices, that measure the average net benefits from mergers. The general presumptions approach is therefore based on the implicit recognition of efficiencies.

The general presumptions approach obviously eliminates the high information costs involved in assessing mergers on a case-by-case basis. Instead, there is now a need for a set of structural indicators that measure the average net expected benefits from mergers. The quality of these structural indicators as a predictor of the net benefits from a specific merger depends on the degree of aggregate uncertainty regarding merger effects. A high aggregate uncertainty may arise for two main reasons: uncertainty related to average market power effects and uncertainty related to average efficiencies.

First, as documented in the theoretical Part 2, each oligopolistic industry is characterised by its own behavioural peculiarities, such as price-setting versus quantity-setting behaviour, collusive or noncollusive behaviour, homogeneous goods or product differentiation, etc. Simple and general formulae of a merger's market power effects, in terms of observables such as market shares and concentration indices, can therefore not be expected to be a good approximation for every industry.[82]

Second, mergers generally differ in the actual efficiencies they realise. Mergers generally create different types of efficiencies with different effects on competition. Moreover, the size of efficiencies (and inefficiencies) may differ significantly across mergers.

4.1.2.3 The sequential approach

The information costs associated with the case-by-case approach and the aggregate uncertainty problems associated with the general presumptions approach raise the question whether there exists an intermediate approach that combines the advantages

of both extremes. The sequential decision-making approach aims to combine aspects of both approaches. Broadly speaking, a sequential decision approach starts by assessing mergers based on general structural criteria. If the merger meets the criteria, then it is accepted. If not, a more detailed analysis is allowed into some, though not necessary all, aspects of the merger.

Most countries do, in fact, adopt some version of the sequential approach in evaluating mergers. For example, a first stage of the procedure consists of some routine tasks to check whether, for example, the total turnover of the merging firms does not exceed a critical level. Only if the firms do not meet these criteria, a further investigation is followed. The reason for this procedure is that information costs are too high to justify a detailed investigation of all (even "minor") cases, yet aggregate uncertainty about the merger's effect is too high to limit the analysis to a routine test on all (in particular borderline) cases.

Once a merger fails the routine tests in the first stage, a more detailed investigation starts. Again the question arises whether the merger authorities should simultaneously consider all factors to assess the net benefits of the merger, or whether, in contrast, a more limited investigation based on general presumptions is preferable. In principle, the various dimensions that may be investigated either simultaneously or in sequential steps include: the definition of the relevant market and a market share test, an entry barriers test, a more detailed test on expected market power effects (e.g. a collusion test), a failing firm test.[83]

At one of these stages a detailed test on the presence of efficiencies may also occur. This then amounts to the recognition of an efficiency defence. The decision whether or not to consider various dimensions simultaneously, sequentially, or not at all, will in general depend on the relative importance of the information costs and aggregate uncertainty associated with structural criteria. We now discuss in more detail the implications of applying a sequential approach for the treatment of efficiencies.

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[82]   An analysis on the usefulness of simple structural indicators along these lines has been done, among others, by Werden and Froeb (1996).

[83]   See, for example, Fisher (1987) for an outline of a detailed sequential procedure.

4.1.3 The efficiency defence

For simplicity, we limit our attention to two central dimensions in merger analysis: market power (or "anti-competitive") effects and efficiencies. The sequential approach then amounts to a two-step approach. In the first step simple structural indicators are computed which implicitly aim to incorporate both market power effects and efficiencies. During this step, there is no explicit analysis of efficiencies, but rather some general presumptions. If the structural indicators meet certain thresholds, then the merger is automatically accepted or rejected. In other cases an efficiency defence is allowed in a second step. In this step market power and efficiency effects are balanced in a detailed and explicit manner. [84]

Two central questions arise in the implementation of the efficiency defence.

(i) How should the thresholds for the structural indicators be determined in the first step?

(ii) How should the detailed analysis of market power and efficiency effects be performed in the second step?

We go into detail regarding the second question in sections 4.2 and 4.3. In the present sub-section we discuss the merger analysis in the first step, in particular the determination of the thresholds for the structural indicators. The determination of the thresholds is of course also of importance in the general presumptions approach. However, as we will show, the actual criteria for acceptance or rejection may differ because of the possibility of a defence in the second step.

To focus ideas, assume that the merger authorities use a specific structural indicator as a measure of the expected net benefits from a merger. For example, the European Commission generally uses market shares of the merging firms. In the United States, the use of concentration indices, in addition to the market share of the merging firms has been popular. In particular, the Herfindahl index of concentration (defined as the sum of all firms' squared market shares) has received a lot of attention.

Figure 2 considers three possible ways on how these structural criteria may be set in the first stage of the investigation. Each line describes the range that the

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[84]   Note that it is also possible to consider three-step procedures. In a first step, general structural indicators are computed. A second step would consider the analysis of market power effects in more detail. A third step would consider the measurement of efficiencies and the balancing with market power effects. In France, such an approach is adopted. The second and third stage could also be reversed. We do not consider these possibilities here.

structural indicator may take. For example, if the structural indicator is the merging firms' joint market share, the range is between zero and one. The points L and H depict the lower and upper threshold levels between which the merger authority decides to pursue a more detailed investigation into efficiencies in the second step.

FIGURE 2: ALTERNATIVE EFFICIENCY DEFENCES
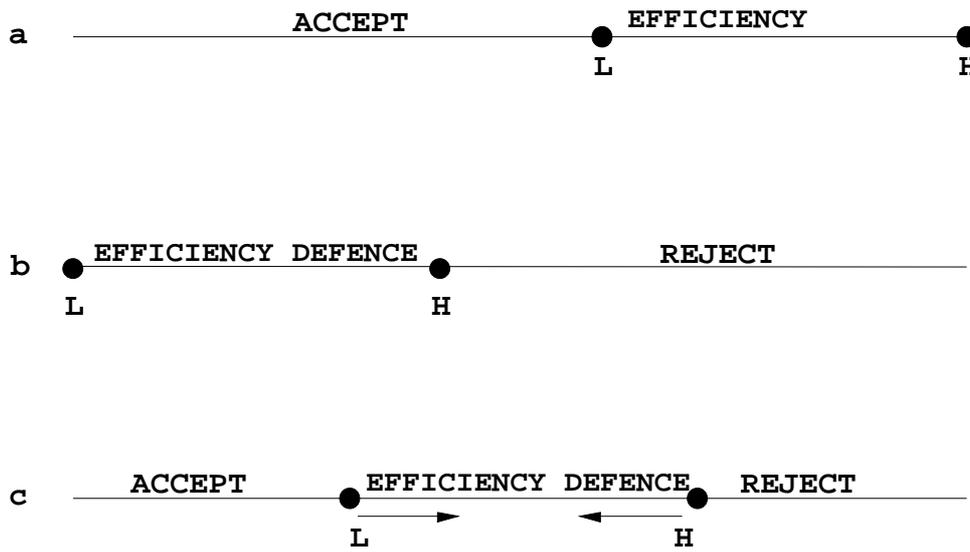
Consider first figure 2a. In this case, mergers are always accepted without a further investigation if the structural indicator (e.g. the merging firms' joint market share) does not exceed a certain threshold level L. An efficiency defence is always allowed if the structural indicator exceeds the threshold L. This is what is most commonly understood under an efficiency defence. It would mean for example that the merger authorities always pass a merger that does not lead to a dominant position; in case of a dominant position an efficiency defence is required. This type of efficiency defence reflects the merger authorities' belief that low structural indicators predict net benefits with a reasonable degree of confidence, whereas high structural indicators have little predictive power on net benefits. This may occur for example when the structural indicator is a very good measure of market power effects, and when the merger authorities believe that efficiencies have a high average and a high variance.

Figure 2b considers the other extreme case in which mergers are always rejected if the structural indicator exceeds a certain threshold level H. An efficiency defence is

allowed for sufficiently low levels of the structural indicator. It would mean for example that a merger authority never allows a merger to monopoly; other mergers are allowed an efficiency defence. This type of efficiency defence reflects the merger authorities' belief that a high structural indicator predicts net harmful effects with a reasonable degree of confidence, whereas a low structural indicator has little predictive power. This may occur for example when the structural indicator is again a very good measure of market power effects, but when the merger authorities believe that efficiencies have a very low (possibly negative) average combined with a high variance.

Figure 2c considers a two-sided efficiency defence. Mergers are always accepted if the structural indicator is below a threshold L, and always rejected if it is above a threshold H. Intermediate levels of the structural indicator require an efficiency defence before a decision is made. This would mean for example that all mergers among small firms are automatically accepted, whereas all mergers to monopoly are always rejected, and a detailed investigation into efficiencies is required in intermediate, or marginal, cases. Note that if the thresholds L and H are moved closer to each other in figure 2c (as indicated by the arrows), then the scope for an efficiency defence becomes more limited. In the extreme case when L and H would become equal to each other, there is no longer an efficiency defence, and instead a general presumption approach is applied. The two-sided efficiency defence may thus be viewed as the most immediate generalisation of the general presumptions approach, where the strict single threshold for acceptance and rejection is broadened to a "grey" zone in which an efficiency defence is allowed. A two-sided efficiency defence would thus reflect the merger authorities' belief that the structural indicators perform relatively well, except in borderline cases.

The above discussion shows that an efficiency defence in a second step may be implemented in various different ways. As discussed in the above paragraphs, the specific type of efficiency defence to be used, one-side or two-sided, depends on the expected net benefits that are predicted by the observed structural indicator. A preliminary question is however whether it is worthwhile to adopt an efficiency defence in the first place. If information costs in carrying out an efficiency investigation are considered to be prohibitively high, then an efficiency defence should not be adopted and we are essentially in the extreme case of Figure 2c, in which L is equal to H (assuming both thresholds are not at the left or right extreme at which all mergers

would either be accepted or rejected). Now consider a drop in the information costs that induces the merger authorities to introduce an efficiency defence. Such a drop in information costs may for example stem from improved measurement methods such as simulation analysis, to be discussed in the next section. When information costs drop sufficiently, the threshold levels L and H no longer coincide: L starts to shift to the left and H starts to shift to the right (i.e. the reverse movement of the arrows indicated on Figure 2c).

The introduction of an efficiency defence, if induced by a drop in information costs, thus calls for two threshold standards instead of one: (1) a threshold level L, which is lower than the previous single threshold so that fewer mergers should be automatically accepted; (2) a threshold level H, which is higher than the previous single threshold so that fewer mergers are automatically rejected once an efficiency defence is introduced. In this sence one could say that the introduction of an efficiency defence in the European Union (based on the consideration that information costs are no longer prohibitive) should lead antitrust authorities to also revise their current threshold approach based on the notion of dominance. On the one hand, the threshold level of dominance (H) above which mergers are automatically blocked without appeal to efficiency considerations should be increased. On the other hand, a "new" threshold level referring to lack of any dominance (L) would need to be installed, below which mergers are accepted without efficiency considerations.

As we have seen in the discussion of the case-by-case approach, information costs in computing both market power and efficiency effects may in fact be high, and may thus make an efficiency defence unpractical (so that L equals H). In sections 4.2 and 4.3 we turn to the issue of how a detailed investigation can be implemented, in particular the question how to compute the actual efficiencies and the efficiency standards that are required to compensate for the market power effects. This discussion should also serve to indicate the potential importance of information costs in introducing an efficiency defence.

4.2 Calculating minimum required efficiencies (MREs)

4.2.1 Introduction

If a merger has failed the test for acceptance or rejection in the first step, then a second step with an efficiency defence may be started. This step requires a more thorough, case-by-case investigation into the possible net beneficial effects arising from efficiencies. It should be emphasised that this step does not simply require an adequate measurement of the actual (expected) efficiencies from the merger, but also a good calculation of the market power (or anti-competitive) effects. Both aspects should be measured in comparable units so as to arrive at an overall assessment of the net benefits. Conceptually, one may thus distinguish between:

    (1)   the measurement of actual efficiencies, and

    (2)   the calculation of minimum required efficiencies (MREs) in order to compensate for market power effects.

    In this sub-section we consider the calculation of MREs[85] in more detail. We focus on MREs for price to decrease, since we interpret the Merger Regulation to be founded on a consumer welfare standard. Nevertheless we also briefly consider MREs for a positive externality.

4.2.2 Minimum required efficiencies in a worst case scenario

4.2.2.1 Expected price increase in a worst case scenario

The expected percentage price increase following a merger may be decomposed into two separate components. First, there is the expected price increase arising from increased (unilateral or collusive) market power, holding costs constant. Second, there is the reduction in marginal cost multiplied by the expected pass-on to consumers.[86]

    The problem with computing the first component is that one needs to have an idea of the current and future expected intensity of competition. Are firms currently

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[85]   The calculation of the minimum required efficiencies may also be phrased as the question what should be the efficiency standard.

[86]   Assume that the merger tends to increase by dP/P percent as a result of the first effect. Then, for the net effect to be non-positive, it is necessary that $(dc/c)(dP/dc)(c/p) \leq -dP/P$, where (dc/c) is the percentage cost reduction, and $\beta = (dP/dc)(c/p)$ is the pass-on elasticity. The pass-on

competing according to the Cournot model or according to the Bertrand model? Are they currently colluding or behaving in another, less well-defined way? How will firms behave after the merger? Is the merger likely to increase the likelihood of collusion, or are only unilateral market power effects to be expected?

To avoid these difficult questions, the merger authorities may opt for a "worst case scenario". Such a worst case scenario can actually be formulated quite naturally from the way the size of the relevant market is currently defined by the European Commission. A Commission Notice of 1997[87] sets out the basic principles for market definition. The relevant antitrust market consists of the minimum number of products for which a hypothetical joint price increase above current levels – in the range of 5-10% – would be profitable (assuming no changes in efficiencies).[88] Thus if the two merging firms would not be able to profitably increase their prices by 5-10%, then the relevant antitrust market would be larger than these two firms, and one can conclude that there is at least no merger to "monopoly." The competition agency has to continue to include additional competing products to the definition of the relevant market until a sufficient number of products is reached so as to make the hypothetical joint price increase profitable.

If the relevant antitrust market is defined according to this procedure, the worst case scenario would be that all firms in the market would increase their price by 5-10% (assuming no changes in efficiencies). This is because a larger price increase would by the definition of the relevant antitrust market not be profitable to the firms. Generally speaking, it seems likely that firms would in fact not increase their prices by as much as 5-10%. Even if a collusive (i.e. joint profit maximising) price is set after the merger, this would generally result in a price increase by less than 5-10%. Lower price increases may also be expected if the merger does not result in collusive price setting.

It might be argued that the worst-case-scenario price increase of 5-10% is an arbitrary number; if the competition agencies had chosen the number of, say, 20% to

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[87] elasticity indicates by how many percent the price would be reduced if cost is reduced by one percent.

[87] Commission Notice on the definition of the relevant market for purposes of Community competition law, published in Official Journal 372 on 9/12/1997.

[88] There has been a debate whether one should consider price increases above current or above competitive levels. See for example Hovenkamp (1994) and Sleuwaegen (1994), and the references therein, for a discussion. In practice, it has been usually chosen to take current levels as the point of reference.

define the relevant antitrust market, then the market definition would have included more firms but the worst-case scenario price increase would also have been higher. However, such a reasoning fails to take into account why the competition agency has chosen the 5-10% number for market definition in the first place. We now go into some detail in how one may interpret this number.

One may view the number of 5-10% as the intolerance level for maximum price increases, to be used during the initial phase of the investigation. This intolerance level is set at around 5-10%, based on some (implicit) general presumption that efficiencies are very likely going to be insufficient to compensate for the 5-10% price rise that would take place without any change in efficiencies. The important question for the competition agency is what is the size of the merger, relative to the size of the relevant antitrust market. First, the proposed merger may involve all firms or more firms than those that are included in the definition of the relevant antitrust market, i.e. a merger to monopoly or "beyond". Our interpretation is that the competition agency would (almost) certainly reject such a merger during the initial phase of the investigation because the intolerance level of 5-10% price increases (absent efficiencies) would have been exceeded.[89]

Second, the proposed merger may involve only part of the firms included in the definition of the relevant antitrust market, i.e. a merger to less than monopoly. The merger may then be accepted or rejected depending on the outcome of a test whether or not the merger creates or strengthens dominance in the relevant market. If the merger passes the dominance test, it would be approved without a more detailed investigation. One may thus interpret the dominance test as the tolerance level for price increases, below which there is a general presumption that the expected anti-competitive effects are small relative to the expected efficiencies.[90]

If the merger fails to pass the dominance test, then it is made subject to a more detailed investigation. In particular, we know that such a merger will, absent cost savings, likely lead to a moderate or significant price increase of at most 5-10%. Expressed differently, the worst case scenario for these mergers is that they increase price by 5-10%.

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[89]   The 5-10% number thus corresponds to the threshold H in figure 2c, above which mergers are certainly rejected.

4.2.2.2 The importance of pass-on

By how much does marginal cost have to drop in order to compensate for the expected worst case scenario price increase? As indicated above, this will depend on the degree of pass-on of costs into consumer prices. For example, suppose that pass-on is 50%. In other words, suppose that if cost is decreased by e.g. 10%, then price is reduced by only 5%. A 50% pass-on would imply that the minimum required reduction in marginal cost, i.e. the MRE, is in the range of 10-20%, i.e. the 5-10% range divided by 50%. More generally, suppose that we know that pass-on of a marginal cost reduction into consumer prices is equal to the parameter β.[91] The required drop in marginal costs to compensate for the price increase in a worst case scenario is then equal to the 5-10% range divided by β. Thus the greater the pass-on parameter β, the greater will be the efficiency standard for price to increase.

Using the procedure of the worst case scenario, the question of computing MREs boils down to estimating the degree of pass-on. This greatly simplifies matters since this is a question that has received a lot of attention in the economic literature. A detailed review on the size of the pass-on parameter β is beyond the scope of this study. Nevertheless, we want to emphasise that there exist several studies that have analysed pass-on from both a theoretical and an empirical perspective.

4.2.2.3 Assessing pass-on in practice

The empirical literature on pass-on is large, and is scattered over various fields in economics, see Chapter 4 for a more detailed discussion. The general empirical finding from this literature is that pass-on is indeed incomplete. The examples cited above suggest that the pass-on parameter β roughly varies between 30% and 70%. Yet we stress that a more detailed study is necessary to obtain a more complete picture. *If* the conclusions would turn out to be robust, then one could conclude that the efficiency standard for price to increase would vary between 7% and 17% if a 5% rule for

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[90] If the dominance test entails a tolerance level for price increases of, say, 2%, then the number 2% corresponds to the threshold L in figure 2 above.

[91] Full pass-on means that that the pass-on parameter $\beta=1$. No pass-on means that $\beta=0$. Partial pass-on means that β is some number between 0 and 1. More than full pass-on, which is possible at least in theory, means that $\beta>1$. Negative pass-on is inconsistent with most models of firm behaviour.

defining the relevant market is used; it would vary between 14% and 33% if a 10% rule is used. One may note that these numbers are rather high. The reason is that they come from the worst case scenario. Nevertheless, there are mergers that may meet such high requirements.

The more confidence one would obtain regarding the estimate of the pass-on parameter across sectors, the easier it would be for the merger authority to revert to a general presumptions approach regarding the MREs (though not necessarily of course regarding actual efficiencies). For example, if it would be found from empirical studies that it is fairly safe to assume a pass-on parameter of 50%, then the efficiency standard would simply amount to twice the hypothetical joint price increase that was used when defining the relevant market. If, in contrast, a detailed review of the literature would point out that the pass-on parameter varies substantially across sectors, then the merger authority may prefer to do a case-by-case analysis in the second step for determining the pass-on parameter. The following considerations may be taken into account under such a case-by-case investigation.

(1) Previous empirical results on pass-on may be used if these are available for the sector in which the merger takes place.

(2) The merging firms may be requested to provide the necessary information for estimating pass-on based on historical data. A descriptive empirical approach to estimating past pass-on behaviour would require fairly standard econometric procedures based on data that the firms should have readily available.

(3) A qualitative analysis may be undertaken on the likelihood that pass-on in the sector of the merging firms will deviate from the mean pass-on parameter in the economy. Such a qualitative analysis may be based on several theoretical arguments.

Theory predicts that the importance of the following three variables in determining the degree of pass-on of a *marginal* cost reduction into consumer prices: the slope of marginal costs, the intensity of competition and the curvature of the price elasticity of demand. First, assume there is perfect competition and marginal costs are constant. In this case marginal cost changes will be fully passed on into consumer prices ($\beta=100\%$). Second, assume there is still perfect competition but that marginal costs are increasing (reflecting capacity constraints). In this case pass-on will be

incomplete, provided at least that industry demand is not perfectly inelastic ($\beta<100\%$). Intuitively, suppose that the competitive firms decide to lower their prices by the extent of the reduction in marginal costs. This price increase would raise industry demand (unless it is perfectly inelastic). In order to meet the increased demand the firms would need to produce more. When marginal cost are increasing due to capacity constraints, this requires firms to charge a higher price than the original decreased price, so that pass-on is incomplete.

Third, assume that there is imperfect competition. In this case firms may have incentives to absorb cost changes by adjusting their markups. The degree of markup absorption depends on the curvature of the price elasticity of demand. To see this, note that percentage markups over marginal costs are given by the inverse of the price elasticity of demand. If the price elasticity of demand is constant, then percentage markups will also be constant. In this case there is no markup absorption of cost changes. If, in contrast, the price elasticity of demand is increasing in price, then firms find it optimal to reduce their markups when costs increase, and increase their markups when costs decrease. Consequently, pass-on is incomplete.[92]

These theoretical considerations teach us that pass-on is expected to be weak when the industry is characterised by increasing marginal costs (capacity constraints), when there is a significant degree of market power, and when there is markup absorption due to an increasing price elasticity of demand. The first two conditions are intuitive and possibly relatively easy to observe variables. The third condition seems more difficult. Nevertheless, even for this case there are some interesting theoretical results that suggest to link the degree of markup absorption to the firms market shares. For example, Feenstra, Gagnon and Knetter (1994) show that the degree of markup absorption depends on the market share of the firms according to a U-shaped pattern.

4.2.2.4 Caveats regarding the worst-case scenario approach

The above procedure proposes to compute the MRE, i.e. the required drop in marginal cost for price to decrease, by focusing on a worst case scenario about the anti-

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[92] To see this intuitively, suppose the firm would fully pass on a cost decrease in a price decrease, hence keeping markups constant. The result would be that the elasticity of demand is reduced at this lower prices. But according to the inverse elasticity rule this would imply it is no longer optimal to charge the same markup, but rather to increase the markup. This implies that an optimising firm will reduce its price by less than the cost decrease.

competitive effects from the merger. The MRE in this worst case scenario is equal to the maximal profitable joint price increase divided by the pass-on parameter β. The maximal profitable joint price increase is equal to 5-10%, because that is how the relevant market has been delineated based on an (implicit) intolerance level of the competition agency, above which a merger would be almost certainly rejected. In this sub-section we are more explicit about possible objections against our worst-case-scenario approach.

First, it should be noted that the 5-10% method for market delineation used by the Commission pre-supposes that the competition agencies, explicitly or implicitly, make an assumption (or know) how the firms outside the (candidate) relevant market respond to a joint increase in price by the firms inside the (candidate) market. For example, the competition agency may presume that the outsiders keep their prices constant when the insiders increase their price by 5-10%. Alternatively, the competition agency may presume that the outsiders respond collusively (i.e. also by 5-10%). Finally, the competition agency may presume that outsiders respond according to Bertrand or Cournot or some other model of strategic behaviour. When we construct our worst case scenario, we assume that the merger authority did use correct information in the market delineation step, also about possible responses by outsiders. This is also how theoretical work prescribes to define the relevant market, see Sleuwaegen (1994) for a discussion. If, however, this is not the case in practice, our methodology may need to be modified. This would occur, for example, if the competition agencies incorrectly assumed that all outsiders keep their prices constant, whereas in practice some would respond collusively to the 5-10% price increase.

A second difficulty with the worst-case-scenario approach is that the 5-10% price increase is only a lower bound for the maximal jointly profitable price increase, and may thus not always be a good approximation of the worst-case-scenario price increase. To see this, suppose that 5-10% procedure leads one to find that the market consists of N firms. Strictly speaking, one can only be certain that N-1 firms would not find it profitable to raise their price by 5-10%. If potential joint market power rises extremely rapidly with the inclusion of the N-th firm, then it may be that firms would

now suddenly find a joint price increase of drastically more than 5% profitable.[93] One may refer to this problem as the integer problem from moving from N-1 to N firms.

In practice, this integer problem should not be exaggerated if one accepts that adding additional firms to the market definition increases joint market power in a more or less smooth manner. The main exception would be in case the definition of the relevant market is just equal to the number of merging firms, so that it concerns a merger to monopoly (in the sense of the relevant market definition). In this case, the two merging firms *may* indeed possibly find it profitable to increase their prices by significantly more than 5-10%; the 5-10% price increase is still a lower bound to the worst case scenario, but the actual worst case price increase may be even higher. The intolerance level of the competition agency is then likely to be exceeded and the merger would need to be rejected without an efficiency defence.

Finally, we note that the European Commission Notice defines the relevant market by considering *maximum profitable* joint price increases; in other countries, the relevant market is defined by considering *optimal* joint price increases.[94] Both approaches may however be interpreted as a worst-case scenario, although one needs to make a somewhat different assumption on the firms' rationality. In the first approach, one assumes that the worst that can happen is that firms increase their price up to the point where this is no longer profitable compared to the pre-merger situation. In the second approach, one assumes that the worst that can happen is that the firms set their price in a jointly optimal way.

4.2.3 Minimum required efficiencies based on specific models of competition

4.2.3.1 Introduction

The procedure outlined in the previous sub-section requires a minimal amount of information in order to compute the MREs for price to decrease. Essentially, only the

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[93]   This can be illustrated in a simplified model of N price-setting firms without capacitiy constraints selling homogeneous goods. Including less than N firms in the market definition will not alter the firms' joint market power. When all N firms are included, they suddenly obtain market power, the degree of which depends on the elasticty of market demand; if market demand is very inelastic (little outside substitutes), the maximally profitable joint price increase may be significantly higher than 5%.

[94]   In practice, the European Commission may not be enough information to distinguish between maximum profitable and optimal joint price increases.

degree of pass-on needs to be estimated. A disadvantage of the approach is that it starts from a worst case scenario. In reality, it is possible and perhaps even likely that firms would raise their price by less than the assumed 5-10% amount (ignoring changes in efficiencies). This would especially be the case when the relevant market includes a high number of firms, since in this case post-merger collusion can presumably be ruled out, and a non-collusive model of oligopoly may be more likely to apply. Therefore, the procedure outlined in the previous sub-section may impose too high MREs and lead to a rejection of mergers with potential net benefits.

Nevertheless, the construction of MREs based on specific non-collusive models of competition is subject to some reservation. In the EU, a merger can only be blocked if it creates or strengthens a dominant position. Hence, only in case of dominance there is need for an efficiency defence. A firm is dominant if it has a large degree of market power. In such case one talks more precisely of single firm dominance. The Commission has widened the concept of dominance to also include joint, or oligopolistic, dominance. The relevance of joint dominance in merger cases was confirmed by the Court in *Kali+Saltz*. According to Morgan (1996) joint dominance has, using economic terminology, been interpreted as collusion. If this is correct, only mergers that create single firm dominance, or that lead to collusion, risk being blocked in the E.U. Hence, there may only be a need to construct an efficiency defence for collusive markets, and not for markets characterised by for example Cournot or Bertrand type of competition. If this is correct, then the worst case scenario described above is appropriate.

It is nevertheless instructive to also consider the construction of MREs based on non-collusive models of competition. One reason for this is that the interpretation of joint dominance as only including collusion, and not non-collusive oligopolies, might be subject to revisions in the future. In fact, there is no obvious economic ground for this restriction. If a merger leads to increased prices and harms consumers, it is not important to the consumers if the price increase is due to a unilateral action by the merging firms, or if it is due to co-ordinated actions among all firms.

In what follows, we consider some specific models of competition to derive explicit formulae of the MREs for price to decrease. If these models of competition can be shown to apply with a reasonable degree of confidence to the industry in which the merger takes place, then these derived MREs may be more accurate. However, we

would recommend to place the burden of proof for applying these formulae to the merging firms rather than to the merger authorities. First, the merging firms are likely too have better information about the nature of competition in their industry. Furthermore, the merging firms may be supposed to have carefully assessed anti-competitive effects of the mergers (see e.g. Song Shin, 1998, for a formal argument along these lines).

We distinguish between two types of models: industries with homogeneous goods and Cournot competition, and industries with product differentiation and Bertrand competition.[95] We make some simplifying assumptions in order to derive explicit formulae. The derived formulae for the efficiency standards are easy to interpret, they are based on relatively easy to observe variables, and they can be easily and quickly implemented. The disadvantage is that the formulae for the efficiency standards may be quite sensitive to the assumptions regarding pre-merger and post-merger competition. In the next sub-section we describe the computationally more complex simulation approach. This approach shares much of the economic intuition of the simple models, and at the same time allows for significantly more flexibility and realism in modelling competition.

4.2.3.2 Homogeneous products and Cournot competition

Consider a merger between firm A and firm B. Farrell and Shapiro (1990) consider a homogeneous goods market with Cournot competition. Denote the (single) pre-merger price of the homogeneous good by P; the marginal cost of firm A and B by MC_A and MC_B, respectively; and the marginal cost of the merged entity (at the pre-merger production level) by MC^M. Farrell and Shapiro (1991) find that a merger reduces price if, and only if, the merged firm's markup (at the pre-merger production level) would be greater than the sum of the markups of the constituent firms before the merger, i.e. $P - MC^M > (P - MC_A) + (P - MC_B)$. Let us say that firm A has a marginal cost that is lower than (or equal to) firm B's. The condition may then be rewritten in terms of the required cost reduction below the lowest cost firm:

$$MC_A - MC^M > P - MC_B.$$

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[95]   See the theoretical section for a more detailed discussion of both alternative assumptions.

In words, the reduction in the marginal cost of the lowest cost firm, firm A, must exceed firm B's pre-merger markup. This condition is intuitive: the required marginal cost reduction is larger the larger is the firms pre-merger market power. A problem with the formula is that it depends on not so easy to observe variables: marginal cost data cannot easily be retrieved from accounting cost data. Yet, using the equilibrium conditions for markups of the Cournot model it is possible to rewrite the above condition as:

$$\frac{MC_A - MC^M}{MC_A} > \frac{s_B}{\varepsilon - s_A},$$

where s_A and s_B are the market shares of firm A and B, and ε is the price elasticity of market demand, i.e. the effect of an increase in P by one percent on market demand in percent (in absolute terms). In words, the required percentage reduction in marginal cost below the low cost firm A's marginal cost must exceed an easy-to-compute threshold $s_B/(\varepsilon-s_B)$. All one needs to know is the market share of each partner before the merger, and the market elasticity of demand. Intuitively, as the market share of either firm A or firm B increases, or as the price elasticity of market demand decreases, the required percentage cost reduction increases.[96]

One may distinguish between two extreme cases. On the one hand, if the market share of firm B becomes very small, then the required reduction in the marginal cost below the low cost firm A's pre-merger marginal cost can be very small. The acquisition of a small firm thus puts very low MREs. On the other hand, if the joint market share of the merging firms exceeds the price elasticity of market demand ($s_A+s_B>\varepsilon$), then the merger can never reduce price, even if the marginal cost would drop to zero after the merger.[97] In less extreme cases, the threshold efficiency level needs to be computed. For example, if firm A and B have a market share of 30 percent and 10 percent, and if the price elasticity of market demand equals one, then the required percentage reduction in A's marginal cost is 33 percent; if the merging firms' joint market share of 40 percent is evenly distributed (i.e. each firm has 20 percent), then the required marginal cost reduction is 25 percent.

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[96] Note that this formula is also consistent with frequently used structural indicators, i.e. market shares and elasticities.

[97] In a Cournot equilibrium, it is also the case that $s_A<\varepsilon$ and $s_B<\varepsilon$.

From a practical perspective, it is necessary to compute the firms' market shares and the price elasticity of market demand. A prerequisite to both is a proper definition of what constitutes the relevant market. In the previous sub-section we discussed how the relevant market is defined according to the Commission's notice.[98] To compute the price elasticity of demand (once the market is defined), one may follow an econometric approach after gathering historical information on prices, total market demand and other variables such as income. In many cases, price elasticities of market demand may also be available from academic publications or from industry sources. If none of these possibilities is available, reasonable values for elasticities may be assumed and the robustness regarding alternative assumptions will need to be assessed.

4.2.3.3 Differentiated products and Bertrand competition

The above simple formula applies if firms produce homogeneous goods. When products are differentiated several modifications need to be made. There is no longer a single price for both products. As a consequence, there is no single notion for the price elasticity of market demand. More fundamentally, one needs to address the issue of how products are differentiated. At the one extreme, products may be differentiated symmetrically, with all products in the industry being equally close (or distant) substitutes for one another. At the other extreme, product differentiation may be asymmetric, with each product having only one or two direct competitors and competition being highly localised.

Generally speaking, with product differentiation the effects of mergers on prices may be phrased in terms of own- and cross-price elasticities of demand for the products. The own-price elasticity of demand for product A, ε_{AA}, is the effect on the demand for product A (in percentage terms) when its price is increased by one percent. The cross-price elasticity of demand for product B with respect to the price of product A, ε_{AB}, is the effect on product B's demand (in percentage terms) when price of product A is increased by one percent. The diversion ratio δ_A is the ratio $\varepsilon_{AB}/\varepsilon_{AA}$, i.e. the proportion of lost sales that is captured by product B, when product A's price is increased. Put differently, the diversion ratio is the proportion of consumers for which

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[98]   For a review, see for example also Sleuwaegen (1994).

product B is the second best alternative to product A. Similar concepts may be defined to measure the effect of changes in the price of product B (ε_{BB}, ε_{BA}, δ_B).

The diversion ratio δ_A is very important in merger analysis since it provides a measure of the intensity of pre-merger competition between A and B. Suppose that product A and B are merged into a single company. If the diversion ratio is very small, then A and B are no close competitors and the merger should have no significant impact on product A's market power. If the diversion ratio is high, and if, in addition, firm A and B do not face much competition from other products in the market, then a significant increase in market power may be expected. What cost efficiencies are required for the merger to reduce price despite a possible increase in market power? If one is willing to assume that the own- and cross-price elasticities do not vary as prices increase, then the following formula for the MRE may be derived:[99]

$$\frac{MC_A - MC_A^M}{MC_A} > \frac{1}{e_{AA} - 1} \frac{d_B(1 + d_A)}{1 - d_A d_B}.$$

In the special case in which products A and B are symmetric, this formula would simplify to:

$$\frac{MC_A - MC_A^M}{MC_A} > \frac{1}{e_{AA} - 1} \frac{d_A}{1 - d_A}.$$

For example, suppose that the price elasticity of demand ε_{AA} is 3 (implying a pre-merger markup of 33 percent); and that the diversion ratio δ_A is 0.2 (20 percent of the sales lost go to product B when A increases its price). The efficiency standard is then a marginal cost reduction of 12.5 percent. More generally speaking, the above formulae imply that the efficiency standard for the price of product A to decrease is greater, as the elasticity of product A's demand decreases and as the diversion ratio increases. This is intuitive since a low price elasticity reflects high pre-merger market power, and a high diversion ratio reflects intense competition between the merging products.

If one makes the further (strong) assumption that the ratio of two products market shares are independent of the available products in the market, then one can compute the diversion ratio in terms of market shares. Under this independence assumption the diversion ratio δ_A would equal $s_B/(1-s_A)$, i.e. the probability that B is

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[99] This formula assumes firms compete in price, rather than in quantities. The derivation of the formula is tedious and is available on request. For some related work, see Fisher et al. (1989), Stockum (1993), Werden (1996) and Bian and McFetridge (1995, 1997).

second best for product A equals the market share of product B relative to the joint market share of all goods except A. Willig (1991) has made this observation to provide a foundation of traditional merger analysis based on market shares. Indeed, substituting out the diversion ratio δ_A in the above formula, one obtains:

$$\frac{MC_A - MC_A^M}{MC_A} > \frac{1}{e_{AA} - 1} \frac{s_A}{1 - 2s_A}$$

This formula shows some resemblance to the efficiency standard formula for homogeneous goods (and Cournot competition). It emphasises once again that information on the price elasticity and market shares are critical in assessing the required efficiencies.

The above formulae assume that the elasticities of demand are constant. This may be a good approximation for evaluating small changes around the initial pre-merger equilibrium. However, when merger occur, a nontrivial change in equilibrium takes place, so that the constant elasticity assumption is no longer innocuous. To the extent that the elasticity of demand for a product *increases* as the price of that product increases, post-merger market power would be overestimated under a constant elasticity assumption, and the required efficiencies for price to decrease may be less than implied by the above formulae. If the constant elasticity assumption is believed to be unrealistic, then a more general approach needs to be adopted, presumably requiring simulation analysis (see below).

4.2.3.4 Assessing elasticities of demand

An important practical problem with the above formulae is how to compute the own- and cross-price elasticities of demand, and the implied diversion ratio. We provided a simple procedure above to compute the diversion ratio in terms of market shares in a simplified model of product differentiation. Such a procedure may be useful as a first approximation, or when data are not easily available. Similarly, one may make use of survey data or "common sense" to estimate the diversion ratio as the proportion of consumers for which product B would be the second choice to product A.

If detailed data on prices and market shares of all products in the market are available, then one may be able to estimate all own- and cross-price elasticities (and the implied diversion ratio) through an econometric model of product differentiation. Such

models of product differentiation have been estimated econometrically for the automobile market by Bresnahan (1981), Berry, Levinsohn and Pakes (1995), Verboven (1996), among others; for the ready-to-eat cereal industry by Nevo (1998). The limited number of studies is largely due to the high data requirements, but more studies may be expected as more data become available (for example due to the detailed scanner data from supermarkets).

Another approach that has been used to estimate elasticities is called "residual demand analysis". This approach[100] proposes to focus only on the own- and cross-elasticities faced by the merging firms, after substituting out the responses by the competitors. The other elasticities need not to be known for the purposes of merger analysis, so that the information requirements are greatly reduced. The only data that are needed are historical data on the merging firms market shares and prices (which may be requested during the investigation), as well as some market-level variables affecting the industry. Data on the competitors prices and market shares are not needed. Intuitively, residual demand analysis makes it possible to determine whether or not the firms proposing to merge have been close competitors in the past and face little competition from others (in which case the merger would require high efficiencies). In fact, the obtained estimates for the own- and cross-price elasticities may be used to compute the diversion ratio and substituted into the simple formulae for minimum required efficiencies derived in sub-section 4.2.3.3. Such a procedure would require a careful analysis by economists.

4.2.4 Minimum required efficiencies using simulation analysis

4.2.4.1 Introduction

As shown above, for some special cases of oligopolistic behaviour it is relatively easy to compute the efficiency standards for prices to decrease. Several simplifications were necessary to derive these formulae, such as the assumption that goods are homogeneous, or, under differentiated products, the assumption of a constant elasticity of demand. Furthermore, we did not consider models in which there is both product differentiation and Cournot behaviour (capacity constraints). Finally, we did not

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[100]   Baker and Bresnahan (1985) originally proposed this procedure and applied it to the beer industry. The methodology has been applied in several cases, see for example Hausman,

consider explicit formulas for total welfare to increase. No simple formulae to compute efficiency standards for welfare to increase are available. For these reasons, these formulae should only be treated as indicators, not as definite tests in borderline cases. A thorough robustness analysis, by considering alternative (plausible) values of elasticities, market shares, etc…, would certainly help in obtaining greater confidence in the obtained threshold conditions.

At the same time, it may be worthwhile in certain cases to follow a more realistic, in-depth calculation of efficiency standards by applying simulation analysis. Simulation analysis allows one to specify the nature of competitive interaction in the industry without a need to make strong simplifying assumptions. The approach has become increasingly popular in evaluating mergers in the U.S. in response to increasing criticism against the use of simplified formulae that do not apply to the industry under investigation. More recently, simulation analysis has also been applied in Canadian investigations. As computer programs develop and become more user-friendly, there seems to be little reason for not considering simulations in merger analysis in various cases.

A simulation analysis for mergers can be broken down in three separate steps: (1) development of the model of competitive interaction, (2) model parameter calibration, and (3) simulation of post-merger equilibrium, including the computation of efficiency standards.[101]

4.2.4.2 Development of the model of competitive interaction

In this step, one investigates how the nature of competitive interaction can be best described. In Part 2 various models where discussed. First, one needs to determine whether products are homogenous or differentiated. If they are differentiated, it is necessary to find out the precise nature of differentiation, i.e. is competition symmetric between all firms in the industry, or is competition localised between smaller subsets of products or firms. Second, it is necessary to specify the cost conditions of the firms. Can firms compete in prices without accounting for capacity constraints? Or do firms face binding capacity constraints so resemble Cournot quantity-setting firms? Do firms

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Leonard and Zona (1994) for the beer industry, or Hausman (1994) for the ready-to-eat cereal industry.

set prices (or quantities) unilaterally, or in a co-ordinated manner? A great advantage of simulation analysis is that it allows one to consider, at least in principle, all these possibilities.

To facilitate the task in this step, the investigator may decide to apply one of the existing programs that has been used in other investigations. For example, Froeb and Werden (1993, 1994) have intensively used the logit and nested logit model of product differentiation. The first model allows for product differentiation, but assumes that all products compete symmetrically; the second model allows for localised competition between groups or subgroups of products.

4.2.4.3 Model parameter calibration

In this step, data on the products' current prices and markets shares are substituted into the model, as well as a measure for the price elasticity of market demand. The data requirements are thus limited and are no larger than needed when one would stick with the simple threshold conditions discussed in the previous sub-section. After these data are substituted into the model, it is possible to calibrate the model and retrieve the firm-specific parameter values for marginal cost and demand.

To understand this, suppose there are 10 products in the market. Assume that each product has a different marginal cost and possibly also a different valuation (quality), which are not directly observed by the investigator. Assume that other parameters, such as a measure for the price elasticity of market demand, have known values. The investigator observes each product's own price and its own market share, which are interpreted as the equilibrium outcome of consumer demand and firm pricing decisions. Calibrating the model now consists of inverting the system of 10 demand and pricing equations to retrieve 10 firm-specific valuations and marginal cost parameters. Intuitively, if two products have the same price but one has a higher market share, then calibration would reveal that the more popular model has a higher valuation. The unobserved marginal cost and demand parameters may thus be inferred from the observed equilibrium values for prices and demand, assuming any other parameters are known.

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[101]   Froeb and Werden (1994) provide a detailed description on how to perform model simulations.
        They make use of the Mathematica software package.

In fact, the own- and cross-price elasticities are thus retrieved from the current data on the firms' prices and market shares, usually augmented with some indication of the price elasticity of the overall market demand. There is thus in principle no need for detailed data to econometrically estimate all elasticities. A disadvantage may be that the retrieved elasticities are not as reliable as those obtained through an econometric procedure. This issue can be overcome through a detailed sensitivity analysis.

4.2.4.4 Simulation of post-merger equilibrium

The previous two steps fully quantify the model of competitive interaction through a mixture of specification assumptions and parameter calibrations based on the pre-merger equilibrium. The final step is to specify the changes to the model as implied by the merger and compute the new prices and market shares. One may then easily compute changes in prices, consumer surplus and total welfare following the merger. The first change that needs to be made to the model is the assumption of price-setting. Where the merging firms previously set prices independently, they now may be expected to act in a co-ordinated way and take into account the effects on each others' profit. This change will tend to increase prices.

A second change may be the presence of efficiencies realised by the merger. The most direct way of simulation analysis would be to re-compute the equilibrium prices and market shares for alternative levels of efficiencies that may involved in the merger. In particular, as the reduction in marginal cost realised by one or both of the firms increases, the expected price increase falls. There will be a critical level for marginal costs for which the merger just leaves the prices of the merging products unaffected. This critical level is a generalisation of the efficiency standards for price to decrease derived in the discussion based on simple formulae. A simulation analysis also allows one to compute minimum required reductions in marginal or average costs for mergers to exhibit a positive externality or to increase total surplus. We are thus left with a very powerful and generally applicable instrument for analysing the likely effects of mergers and calculating the efficiency standards for price to decrease or total surplus to increase.[102]

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[102] Of particular interest are also the simulations done by Froeb and Werden (1993) to assess the validity traditional structural criteria (as implemented in the first step of merger assessment). They find that the increase in the Herfindahl index is a far better predictor for beneficial

4.2.4.5 A hypothetical example

To illustrate the simulation approach regarding merger analysis, Werden and Froeb (1994) simulate the effect of mergers of long distance carriers. They start from an oligopoly model with product differentiation and price-setting firms. They use the logit model as the specific model partly because the US 1992 merger guidelines use this as the reference model for differentiated products analysis, and partly because it has modest data requirements: prices, market shares, a measure of aggregate price elasticity of demand, and a cross elasticity parameter. Furthermore, even though the logit model does not generate analytic solutions for equilibrium prices, consumer surplus and welfare, it has proved to be a tractable model for numerical analysis.

The model has various general predictions regarding mergers: (1) prices of all products increase as a result of the merger, but the magnitudes of the price increases are very different across products. The price of the small merging partner increases by more than the price of the larger partner. The weighted average of the merging partners' prices increases much more than the prices of the non-merging outsiders. The larger non-merging firms increase price more than the smaller firms. Mergers that increase price may at the same time increase welfare because of output reallocation effects. To understand the net outcome for consumer surplus and/or welfare, a simulation analysis can be very helpful.

Froeb and Werden consider hypothetical mergers among US long-distance carriers. For this industry good data on market shares and prices are available; commonly accepted measures on price elasticities are available. In a first scenario they assume that the merger has no effect on costs. Under this scenario, they find that all mergers involving AT&T have significant adverse welfare effects, and mergers not involving AT&T have only small effects. In a second scenario, they assume that the merging partners marginal costs equal the minimum of the two merging firms marginal costs before the merger. In this scenario all mergers of pairs of long-distance carriers increase social welfare, except a merger between AT&T and MCI. Table 1 below illustrates these computations.

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mergers than either the combined market share of the merging firms or the post-merger

Table 1. Price and welfare effects of hypothetical mergers in the U.S. long-distance carrier market

Change in:	No cost advantage from merger		Cost advantages from merger	
	consumer surplus	total welfare	consumer surplus	total welfare
AT&T—MCI	-5.63	-2.296	-5.06	-0.587
AT&T—Sprint	-3.40	-1.243	-2.91	0.130
AT&T—Minor	-1.45	-0.488	-1.21	0.162
MCI—Sprint	-0.98	-0.046	-0.56	0.306
MCI—Minor	-0.43	-0.011	-0.20	0.195
Sprint—Minor	-0.27	-0.000	-.20	0.047
Minor—Minor	-0.12	+0.003	-0.13	0.003

Note: all numbers are in percent of premerger revenues. Minor=representative other firm.

Source: Werden and Froeb (1994), Tables 3 and 5.

A merger between AT&T and MCI has significant price effects both with and without the above mentioned possible cost savings. Also a merger between AT&T and Sprint has significant price effects. Regarding welfare effects, only a merger without cost savings between AT&T and MCI would cause significant adverse effects.

Note that these computations are only hypothetical and one should not generalise their findings to hypothetical mergers in other industries. Yet the calculations illustrate that simulation analysis does provide a potentially powerful tool to merger analysis. An extension of Froeb's and Werden's analysis could have been to simulate the minimum required cost savings for consumer surplus or welfare to increase. These would than fit directly into our framework. In addition, it would be wise to perform a more detailed robustness analysis regarding merger effects. For example, one could redo their calculation based on the hypothesis that the industry becomes collusive after the merger.

4.2.4.6 Simulation analysis in practice

Simulation analysis has been applied several times in the U.S. In U.S. v. Interstate Bakeries, The Justice Department blocked a merger between white pan bread companies in Chicago using this analysis. In the L'Oreal acquisition of Maybelline, the methodology was again used by the Justice Department to allow a merger between competing cosmetics firms, a merger that probably would have been blocked using the structural analysis of the Guidelines. More recently, simulation analysis has also been

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Herfindahl index.

applied in Canadian merger cases. The explanation for the recent trend towards simulation analysis is related to the recent theoretical advances in modelling the competitive effects of mergers, combined with improvements in computational methods.

4.2.5 Minimum required efficiencies for a positive externality

The efficiency standard for price to decrease may of course not always be met. Economists often argue that the relevant objective for the government is total social surplus, which is the sum of both consumer and producer surplus. For this reason one may allow the merging firms to appeal to the fact that the merger could create a positive externality to the consumers and the competing firms jointly. Farrell and Shapiro considered this possibility (assuming homogeneous goods). As explained in Part 2, mergers that increase price may still create a positive externality since the outsider firms may expand their output after the merger. To the extent that these outsider firms are relatively more efficient than the insiders, the merger may exhibit a positive externality. A positive externality is a sufficient (though not a necessary) condition for total surplus to increase, assuming that the proposed merger is privately profitable.

Farrell and Shapiro derive the condition that the sum of the merging firms market shares $s_A + s_B$ should not exceed a concentration index CI_O of the outsider firms market shares for the merger to create a positive externality. More specifically, the critical index is:

$$CI_O = \sum_{i \in O} s_i^2 \left(\frac{1 - s_i \eta}{s_i + \mu_i (\varepsilon - s_i)} \right),$$

where η is the elasticity of the slope of the demand curve, and μ_i is the elasticity of outsider firm i's marginal cost with respect to output.

This index requires quite detailed knowledge about several specific structural features of the industry, both concerning cost and demand conditions. In some interesting special cases this index can be simplified. Let H_O be the sum the outsiders' squared market shares (i.e. the Herfindahl index of the outsiders) and H_O^* be the sum of the outsiders cubed market shares. The following matrix then provides measures of CI_O in terms of these indices and elasticities for four alternative cases, depending on

whether the marginal cost function is constant or (linearly) upward sloping, and whether the demand curve is linear or of a constant elasticity form.

CI_O	linear demand	constant elasticity
constant MC	$\dfrac{1}{2}$	$\dfrac{1}{2}-\left(1+\dfrac{1}{e}\right)\dfrac{H_o}{2}$
upward sloping MC	$\dfrac{H_o}{e}$	$\dfrac{H_o}{e}-\left(1+\dfrac{1}{e}\right)\dfrac{H_o^*}{e}$

Consider first the left column, for linear demand. If marginal cost is constant, then the market share of the merging firms should be less than 50 percent for the merger to create a positive externality. In this specific case, all that matters is the market share of the merging firms relative to the outsiders; the distribution of output across competitors is irrelevant. In contrast, if marginal cost is upward sloping, then the distribution of output across the outsiders does matter. The market share of the merging firms should not exceed the Herfindahl index of concentration among the outsider firms (normalised by the price elasticity of market demand). The more concentration there is across the outsiders, the more likely the merger will create a positive externality. The right column shows that the conditions are stricter in the case of a constant elasticity demand.

The strength of the approach proposed by Farrell and Shapiro is that it derives sufficient conditions for a positive externality that are expressed in relatively easy-to-observe variables, without requiring any knowledge of the actual cost efficiencies arising from the merger.

There are however also several disadvantages with their approach. First, the above examples showed that it is difficult to draw a general conclusion other than that the merging firms' market shares should be small relative to some concentration index CI_O. Nevertheless, this problem may be resolved by applying some robustness analysis using the above (or related) formulae. For example, it would be relatively safe to conclude that the merger creates a positive externality (assuming homogeneous goods and Cournot competition) if the joint market share of the merging firms does not exceed any of the four concentration indices in the above matrix.

A more important problem with the above externality analysis is that simple formulas are only available for a market with quantity competition and homogeneous goods. No simple rules exist under price competition and product differentiation. For

these cases, one would need to resort to simulation analysis. Werden and Froeb (1994) consider simulation analysis to explore the effects of hypothetical mergers among U.S. long distance carriers, and find examples of mergers that increase both price and welfare, without internal cost savings, similar to Farrell and Shapiro's result.

Another important problem with the approach of Farrell and Shapiro is that it looks at the total externality of a merger, assuming it leads to an increase in price. Since merger authorities seem to be primarily interested in consumer surplus, this is perhaps the main reason why their formulae have not been applied.

4.3 Evaluating actual efficiencies

The required efficiency standards computed using one of the methods proposed in the previous section, ought to be confronted with the actual efficiencies realised by the merger. We discuss the evaluation of actual efficiencies in three sub-sections. First, we discuss what types of efficiencies are most likely to have beneficial effects. Second, we consider the question to which extent beneficial efficiencies are likely to be merger-specific. Third, we discuss the issue of verification of efficiencies.

For obvious reasons, much of the discussion draws directly from the discussion in the "check-list" in Part 4.

4.3.1 What types of efficiencies are most likely to be beneficial?

4.3.1.1 Efficiencies and pass-on

In section 4.2 we discussed a methodology for calculating efficiency standards, i.e. the minimum required efficiencies for mergers to decrease price. Broadly speaking, it was shown that the efficiencies should be sufficiently passed-on to consumers. Which types of efficiencies are more likely to result in pass-on?

First, it is necessary to distinguish between fixed and variable costs. Fixed cost savings, such as the avoidance of a duplication of administrative routines, do not affect the marginal costs of the firms. The possibility that these savings will be passed on to consumers is therefore limited. One possibility of pass-on of fixed costs may arise if there is market power also at the other side of the market. In this case bargaining between the firm and its customers may lead to lower prices. Nevertheless, such a consideration should be treated with care. Savings in variable costs directly affect the

pricing decisions of the firm. For this reason, variable cost savings should be given priority in the assessment of efficiencies.

Second, it is important to know the magnitude of (variable) cost savings. Some examples illustrate what considerations may be taken into account. (1) If the merging firms argue that they will realise discounts from buying certain inputs, then one has to provide detailed documentation on the share of the cost of these inputs in overall costs. (2) If it concerns the realisation of scale economies, then it is of course important to be convincing about the extent of scale economies. Also, since long-run economies of scale affect marginal costs only after some time, information on the expected timing of the cost savings must be given. (3) If the cost savings stem merely from rationalisation of production, then it is known from theory that this will never be sufficient to generate price decreases, though it obviously may contribute to other factors.

Third, not only cost savings should be considered. Improvements in product quality constitute a synergy with similar economic effects. The relevant question in this case is whether the claimed efficiencies have the potential of lowering "quality-adjusted prices", see e.g. Rosen (1974).

4.3.1.2 Other considerations

Priority should be given to efficiencies that have real effects, rather than only redistributive (pecuniary) effects. For this reason, one should be careful in taking into account tax savings. Although these may be passed on to consumers, they of course also imply a transfer from the tax payer to the firm.

Another issue concerns the distinction between efficiencies at the level of the merging firms and efficiencies at the level of the market. An example of the efficiencies at the level of the merging firms could be cost savings as a result of specialisation between the plants that are owned by the merged entity. An example of efficiencies at the level of the industry is that the merger between two firms may affect the R&D incentives for the competitors. We discussed this in detail in sub-section 1.1.3.2. These types of efficiencies are potentially very important in some high tech industries. To investigate the role of these efficiencies in practice is not an easy task. One way could be to adopt a simulation analysis, extending the typical oligopoly models used in simulations to a dynamic setting.

A possible reason for why only firm-level efficiencies are considered by most jurisdictions is that they are easier to verify. Even if both types are considered, one may argue that market-level efficiencies should be treated separately, at least in assigning the burden of proof. The reason is that it is probably only concerning the firm-level efficiencies that the firms are (much) better informed than the competition authorities.

Another subtle issue is cost savings (or other efficiencies) that are realised in other markets. On the one hand, one may argue, that it does not matter where the saving of resources occur. In a complete cost-benefit analysis, these savings should be included. However, there are at least two arguments against this view. First, if competition authorities need to study the effect of the merger on more markets (than the so-called relevant market), the analysis would be more complex and hence costly. Moreover, if cost-savings in other markets are included one may argue that also other issues related to these other markets should be addressed by the competition authorities.[103] Second, including efficiencies in other markets makes it necessary to weigh the gains for consumers in those other market against the losses for consumers in the market where competition is harmed.

Efficiencies arising from output reductions should not be given any weight if the focus is on price effects. If however also producer surplus is taken into account, then these savings do matter. Yet note that they are never sufficient to outweigh the reduction in consumers' surplus.[104]

4.3.2 Can efficiencies be created through alternative means?

A question of central importance is whether efficiencies can be achieved through other means than the proposed merger. It is important not to put any *a priori* restrictions on the alternative possibilities and the practical feasibility. The following alternative possibilities may exist for realising the claimed efficiencies: (1) internal growth, (2) a joint venture, (3) a specialisation agreement, (4) a licensing, lease or other contractual agreement, (5) another merger.

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[103]   Today competition agencies focus attention on the effects of the merger on the so-called relevant markets (the market where competition is harmed). A reduction in competition is normally believed to produce dead-weight losses (allocative inefficiencies). However, from an economic perspective this is a very partial analysis. In particular, according to the theory of second-best, a reduction of competition in one market may actually be beneficial for allocative efficiency, if competition is already low in markets for close substitutes. If competition authorities would include efficiencies in other markets, one may argue that they also should take into account second-best considerations.

Three elements need to be addressed when comparing the proposed merger with the alternative possibilities. First, it is necessary to determine which alternative arrangements would be chosen if the merger is blocked (e.g. another merger). Some guidance about which alternatives are most practical may be gained by considering the regular practice of other firms in the industry. Unfortunately, however, economic theory can not give much guidance on this issue.[105] Second, it is necessary to determine the relative costs (e.g. restructuring costs) and expected efficiency benefits from setting up these alternative arrangements. Third, it is necessary to assess the possible anti-competitive effects of these alternative arrangements.

Whenever firms use efficiency arguments, they should be as explicit and as complete as possible regarding these alternative possibilities and their effects. For example, an alternative merger might be preferably with respect to anti-competitive effects when this would involve the integration with a smaller firm or with a foreign firm (more distant competitor). In such a case it should be stated why this alternative merger does not create the potential for equal efficiencies at a similar restructuring cost and with less anti-competitive harm.

4.3.3 How can efficiencies be verified?

The most difficult issue regarding the analysis of efficiencies is their verification. Special care has to be taken so that the analysis of efficiencies can be undertaken with a reasonable degree of confidence and without relying on too costly information collection activities.

4.3.3.1 Burden of proof

It is acknowledged by most merger authorities that the merging firms have the burden of proof regarding the type, likelihood and magnitude of efficiencies, as well as the merger-specificity of the claimed efficiencies. The merging firms may be presumed to

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[104]   The difference is the deadweight loss.

[105]   The reason is that the theory of endogenous mergers is still very incomplete. That theory aims at explaining not only which mergers are likely to occur, but also, as an integral part of the analysis, what would happen absent the merger. Early contributions include Stigler (1950), and Deneckere and Davidson (1985b). More recent contributions are Kamien and Zang (1990, 1991, 1993), Fridolffson and Stennek (1998a-b, 1999), Horn and Persson (1996, 1997), Gowrisankaran (1999).

have more information about their businesses, especially about efficiencies if that was an important factor in deciding upon the merger.[106]

4.3.3.2 Standard of proof

Nevertheless, even if the merging firms have the burden of proof, informational problems remain a key problem, because of the asymmetry of information between the merging firms and the merger authorities. White (1987) and Fisher (1987) argue that efficiencies are typically easy to claim, but hard to prove. Fisher (1987) argues in favour of very high standards for proving actual efficiencies, based on several examples where efficiencies were claimed but presumably were not materialised or could have been materialised in another way. [107] U.S. policy has gradually shifted from a standard of "clear and convincing" evidence, to a standard requiring that efficiencies are "credible" or "clearly demonstrated".

Alternative standards are, of course, rather vague. In what follows below, we explain which elements may be taken into account so as to be able to assess efficiency claims in an as reliable way as possible.

4.3.3.3 The partial efficiency defence

Not all efficiencies are equally easy to verify. For this reason, it would be desirable to distinguish between alternative types of efficiencies not only based on their expected effects, but also based on their verifiability. For example, Areeda and Turner would especially favour efficiencies relating to economies of scale, at least if demand is not growing rapidly. Both the US and the Canadian merger guidelines[108] emphasise production efficiencies (economies of scale and rationalisation) as sources of efficiency that may be more easy to verify, in contrast to dynamic efficiencies (research and development).

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[106]   A theoretical foundation for this principle is given by Son Shin (1997).

[107]   Scherer and Ross (1991) provide other cases. For example, the New York Central-Pennsylvania Railroad merger promised cost savings of about 4 percent, but the actual results from the merger were highly rising costs eventually leading to a quasi-nationalisation.

[108]   See footnote 55.

4.3.3.4 Verification and certification of information

To alleviate the asymmetric information problem between the merging firms and the merger authorities, it may be desirable to put different weight on the amount on efficiency claims, depending on the source that certifies the validity of the information. The Canadian merger guidelines[109] distinguish between the following sources of information: (1) plant- and firm-level accounting statements, (2) internal studies, (3) strategic plans, (4) capital appropriation requests, (5) management consulting studies (where available), or (6) other available data. There may be an important advantage of information that is certified by outsiders such as management consultants, since they need to protect a reputation of future reliability.

It may also be argued that less weight should be assigned to studies on efficiencies that have been prepared *after* the merger has been taken to a detailed investigation by the competition agency. This is because this would reveal that they were not the ostensible basis for the merger decision. Later documents should however not be distinguished altogether, since they may, for example, be prepared to make efficiency claims more specific or in line with the formalities set out by merger guidelines or notices.

4.3.3.5 Post-merger review

Scherer (1991) has proposed to first approve mergers only on a temporary basis. Mergers for which persuasive preliminary evidence on expected efficiencies can be provided may be allowed for a temporary trial period of, for example, three years. At the end of this period, an evaluation can be conducted to find out whether the promised efficiencies have, in fact, been realised. If so, the merger could be definitely accepted. Otherwise, the company may be required to divest again into the two independent parties that existed before the merger.

A main advantage of such a system is that it forces the merging firms to think well ahead of potential future efficiencies, and to make only credible efficiency claims, since making empty promises may be punished later through a costly divestiture decision. At the same time, the competition policy authorities can economise significantly on information costs. There is no need to attempt to verify current claims

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[109]   See footnote 55.

on future efficiencies, since the final decision is made when the relevant information on realised efficiencies is available.

A disadvantage is that the merger process may be very costly.[110] These costs may well be sunk in case the ex post decision goes against the merger. Nevertheless, these costs may in fact serve to make the promised efficiencies credible, since the firms know the rules of the game, including the fact that they may need to divest if false promises are made. Furthermore, the costs of divestiture need not to be exaggerated in modern times, as Scherer argues. Companies now have experience in applying a large variety of reorganisations, such as sell-offs, spin-offs, or leveraged buy-outs, to make parts of their company independent organisations.

The system proposed by Scherer may fit however better into the U.S. antitrust system which already allows the possibility to break up existing firms to reduce market power. Nevertheless, we believe that it is worth thinking about the possibility of allowing mergers only conditionally for a trial period before definite approval.

4.3.3.6 Merger licence fees

Direct verification, certification, or post-merger review all have in common that they require an direct evaluation (either ex ante or ex post) of the actual efficiencies that are (expected to be) realised through the merger. A drastically different approach in screening mergers would be to implement a revelation mechanism through the institution of merger licence fees to be paid to the government.

It is not clear how the licence fee for the merger to be accepted should be determined. This will for example depend on the objective the merger authority has in mind (maximisation of consumer surplus and total welfare). To understand the determination of optimal merger licence fees, a more thorough theoretical analysis is required. One may expect that many of the insights from the asymmetric information (screening) literature would apply.

In practice, (small) fees for approving mergers (dependent on the merger size) have been used in the UK, though presumably not explicitly for screening purposes.

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[110] For example, the merger between Pharmacia and Upjohn is estimated to have cost 1.6 billion dollars during the three years 1995-97 (Affärsvarlden, 1998).

117

4.4 Should there be an efficiency defence?

4.4.1 Arguments for and against an efficiency defence

4.4.1.1 Informational aspects

The above analysis has shown the important potential role of efficiencies in the merger process. Even if there is no evidence that mergers create strong efficiencies on average, some particular mergers do just that. In practice, efficiency considerations are often implicit in merger evaluation. The relevant question is thus not whether, but rather how potential efficiencies should be taken into account in merger control.

We have emphasised the central role of procedures which serve to economise on information costs. The general presumptions approach avoids potentially high information costs, but relies on possibly unreliable structural indicators for prediction the net benefits (including efficiencies). The case-by-case approach may imply significant information costs to measure efficiencies, but does not rely on structural indicators. The sequential approach aims to combine the advantages of both procedures by relying on general presumptions, with the exception of the borderline (or marginal) cases where a case-by-case analysis is taken regarding the anti-competitive and the efficiency effects. Which approach is actually taken, depends on the information costs and the reliability of the structural indicators. This may require some value judgements, but also common sense and experience with actual cases should help to determine which procedure is preferable.

If the intermediate solution of the sequential approach is found desirable, then a reconsideration of the threshold levels is required. As argued in more detail in sub-section 4.1.3, the introduction of an efficiency defence (if based on improved information collection methods) requires a revision of the current single threshold referring to "dominance", which delineates those mergers to be accepted without efficiency analysis from those mergers to be rejected without efficiency analysis. Instead of this single threshold, two thresholds should now be used: a first threshold (L), below which mergers are automatically accepted, and a second threshold (H), above which mergers are automatically be rejected. For the in-between cases an efficiency analysis would then be undertaken. We note that the lower threshold L will typically be below the "dominancel" threshold as currently adopted, whereas the upper threshold H (which one could possibly still label the dominance threshold) should

exceed the dominance threshold as currently adopted. Note that the merger authorities could keep flexibility in determining the threshold levels L and H between which efficiency considerations are allowed. The more optimistic they are about information costs involved in analysing efficiencies, the further apart L and H could be. In an extreme case L could be very small and H very large so that effectively all proposed mergers are allowed efficiency considerations. There is then a full case-by-case approach as currently in the USA.

For those mergers that fall within the range in which an efficiency defence is allowed we propose an approach in which minimum required efficiencies (MREs) need to be compared with actual efficiencies in borderline cases. We propose a relatively simple approach to compute these MREs. This approach focuses on a worst-case scenario regarding anti-competitive effects, and would leave the burden of proof for demonstrating lower anti-competitive effects on the merging firms. The measurement and verification of actual efficiencies may follow rules that partly draw on the experience in other countries.

4.4.1.2 Political considerations

The above discussion has compared the case-by-case, the general presumptions and the sequential approach from an informational point of view. Each approach has its own strengths and weaknesses in treating the possible presence of efficiencies in a reliable, yet computationally tractable way. In this sub-section we point out that there are also political reasons why it may be advantageous (or not) to recognise the presence of efficiencies, at least in principle.

First, there has been the Kali-Salz decision, which the Court for the first time accepted the concept of joint, or oligopolistic, dominance, rather than single firm dominance. This suggests that the merger control policy has become stricter. This development may make it more natural to consider efficiencies more explicitly today.

Second, many merging firms try to make use of efficiency arguments in convincing the merger authorities on the likely net benefits from the merger. At present, the Commission is simply not positioned to consider these efficiency claims in a formal way. It would potentially improve the transparency of merger review that efficiency considerations can be dealt using a clear procedure. See, for example, Neven et al. (1993) or Camesasca (1999) on this.

Third, there is a political argument why it may not be desirable to allow efficiency considerations. One has to be careful that introducing efficiency considerations in a formal way does not open up the possibility of a more active industrial policy. Yet such a problem may be overcome as long as there is sufficient transparency in the procedures. According to Camesasca, the main problem with the current "between-lines" approach is that the Commission has no fall-back line to defend itself against accusations of industrial policy considerations. Furthermore, the perception of political influence on the antitrust review of mergers and regulatory capture by a host of interest groups is aggravated by the limited judicial review of the Commission's decisions. He argues that it is necessary to clarify that "efficiencies" are just that, and as such no open gateway for "other competing values."

4.4.2 Formalities

In this sub-section we discuss some possible actions that may be undertaken so as to take into account some of the findings of this report.

4.4.2.1 The Merger Regulation

According to Articles 2(2) and 2(3) of the Merger Regulation, a concentration which "creates or strengthens a dominant position as a result of which effective competition would be significantly impeded" shall be prohibited. Otherwise it shall be allowed. According to Article 2(1)(b) of the Merger Regulation, the Commission shall, in making this appraisal, take into account:

(a) the development of technical and economic progress, provided that

(b) it is to consumers' advantage, and

(c) does not form an obstacle to competition.[111]

The question is if Article 2(1)(b) allows for efficiency considerations and, in particular, if it constitutes an efficiency defence.

At first glance, the answer appears to be no. In particular, if "form an obstacle to competition" is synonymous with "significantly impeding effective competition," the development of technical and economic progress can only be considered in those

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[111] Moreover, according to preamble 13, the Commission must place its appraisal within the general framework of the achievement of the fundamental objectives referred to in Article 2 of

situations where the merger is to be allowed anyway. The main problem with this interpretation is that it makes Article 2(1)(b) meaningless.[112] Also according to the Commission (1996): "There is no real legal possibility of justifying an efficiency defence under the Merger Regulation. Efficiencies are assumed for all mergers up to the limit of dominance - the 'concentration privilege'. Any efficiency issues are considered in the overall assessment to determine whether dominance has been created or strengthened and not to justify or mitigate that dominance in order to clear a concentration which would otherwise be prohibited." The Commission also points out that the dominance criterion is very strong. At that time (1996), the prohibition rate amongst cases considered under the Merger Regulation was only one percent.[113]

However, in our view, the Merger Regulation may be re-interpreted to include an efficiency defence. Hence, in our view, the introduction of an efficiency defence may not require a change in the Merger Regulation. Remember that the term "competition" takes on different meanings in the literature. In some literature the word competition is synonymous with the absence of market power.[114] Market power may be measured by the price to cost mark-up that firms charge. With this definition, horizontal mergers most often reduce competition (that is increase mark-ups) at least slightly[115] and some of them significantly reduce competition (increase mark-ups). In other literature, however, the word "competition" has been used in another sense, namely to mean the price level.[116] Using this definition, horizontal mergers can be either pro-competitive (those that reduce price) or anti-competitive (those that increase price). Now, if we assume that the Merger Regulation uses the word "competition" in the first sense, this means that mergers that significantly increase mark-ups should be prohibited. Furthermore, Article 2(1)(b) cannot be used to save any horizontal

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the Treaty, including that of strengthening the Community's economic and social cohesion, referred to in Article 130a.

[112] The same point was made by Neven, Nuttall, and Seabright (1993, p. 62). They argue that the wording of the Merger Regulation is somewhat odd, since it suggests that the efficiency defence can be used only when there is no conflict between efficiency and competition; that is when an efficiency defence is unnecessary.

[113] Also in cases brought under Article 86 the Commission has a dominance test and efficiency gains will not justify the abuse of a dominant position. Under Article 85, by contrast, any agreement which restricts competition will have to demonstrate efficiency benefits in direct proportion to the degree of competition which is restricted.

[114] Most economists would probably use this definition.

[115] There are a few reasons for why a horizontal merger would not reduce competition, such as if the merger triggers immediate entry, or if one of the firms is failing, or if the firms colluded perfectly before the merger.

mergers, since they do form an obstacle to competition, that is increase mark-ups. (This is just a restatement of the first interpretation above.)

In contrast, if we assume that the Merger Regulation uses the word "competition" in the second sense, then Articles 2(2-3) state that a merger shall be prohibited if, and only if, the merger increases price. Article 2(1)(b) would amount to an efficiency defence. The Commission should consider efficiencies (the development of technical and economic progress), provided that these efficiencies do not lead to an increase in the price level.[117] The condition(s) for efficiencies to be considered guarantees that the potential negative side-effects of efficiencies do not dominate the beneficial effects of efficiencies.[118] Thus, with this interpretation the Regulation allows an efficiency defence. However, a comparison with the efficiency defence under Article 81(3) of the EC Treaty, suggests that the efficiency defence under the Merger Regulation (if any) is intended to be limited.

Two approaches can be taken to solving the problem of the ambiguity of Article 2(1)(b). The first approach is to reinterpret this provision to mean that efficiency considerations may be considered. We consider that such a reinterpretation is possible, i.e. does not contradict the other articles of the legislation, as long as efficiencies are required to be sufficient to reduce price. If such a reinterpretation is made, it may be more convenient to talk about rebuttal than defence (see the check-list in Part 4). Moreover, if such a reinterpretation is made it may be desirable to publish a Notice commenting on the interpretation of article 2(1)(b) as discussed below. A problem with this approach is that it could limit the treatment of efficiencies to dynamic efficiencies and not include static efficiencies as is done for agreements between firms in Article 81(3) of the Treaty. While Article 81(3) stipulates that an agreement must improve the production or distribution of goods (usually interpreted as static efficiencies), or promote technical or economic progress (usually interpreted as dynamic efficiencies) to

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[116] This definition has at least implicitly been used in much anti-trust literature.

[117] Interpreting the Regulation this way, "not form an obstacle to competition" and "to consumers' advantage" are synonymous.

[118] Cost savings are per se desirable. However, cost savings can have negative side effects. In particular, if two firms merge and thereby lower their variable costs, they become a tougher competitor. Actually, if the cost reduction is big enough, the merger may imply that competitors are driven out of the market, or that new entry is blocked. In this sense, cost savings may be anti-competitive (price increasing). In this context, it is interesting to note that (for example) technical advantages are considered relevant in the assessment of dominance (see for example *Hoffman La Roche v. Commission*).

be exempted, Article 2.1(b) of the Merger Regulation only requires the Commission to consider the development of technical and economic progress.

A second approach is to rewrite the Merger Regulation. The advantage of this approach is that the role of efficiencies can be considered in a more flexible way, for example without necessarily focusing exclusively on consumer interests.[119]

Whatever approach is taken, the Merger Regulation should limit attention to a recognition of the potential role of efficiencies in a flexible and unambiguous way. Details on how to incorporate efficiencies in the assessment of mergers do not belong in the Merger Regulation, since they should be subject to periodic evaluation.

4.4.2.2 Notice

To outline the specific procedure by which efficiencies are (or are not) taken into account, it would be desirable to publish a separate notice, comparable in goals to the relevant sections of the "Merger guidelines" published in the USA or Canada[120]. Such a Notice could be based on various findings discussed in the present section, outline the circumstances in which efficiencies are explicitly considered and how minimum required and actual efficiencies are compared.

The advantage of a separate Notice is that it can be changed in a more flexible way, taking into account recent developments in the role of efficiencies and in our thinking about them.

The publication of a Notice may be particularly important if the firms themselves have to carry out the burden of proving efficiencies. A Notice which describes in detail how efficiencies are considered may also have a commitment value. The increased transparency would make it difficult to deviate from the described procedure and worries about industrial policy might be reduced.

4.4.2.3 Post-merger review

We have stressed that the procedure to be adopted for incorporating efficiencies depends on the role of information costs and the reliability of structural indicators as predictors of net effects. The actual mergers that have been proposed (and accepted)

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[119]   Our review of the EU practice revealed that the efficiency defence under Article 81(3) of the Treaty of Rome may be more far reaching than the efficiency defence that could be constructed under Article 2(1)(b) of the Merger Regulation.

provide a unique data base for the merger authorities to continuously evaluate their policy. For example, the merging firms may be asked to provide evidence on the realisation (or lack thereof) of promised efficiencies. This would allow the merger authorities to obtain a more complete picture on the distribution of efficiency gains from mergers, in particular the average and the variance of efficiencies. Similarly, the merging firms may be asked to provide detailed historical data on competitive variables, in particular the evolution of prices and market shares. This would enable merger authorities to obtain a more precise idea of the degree of pass-on. A post-merger review could thus significantly contribute to experience and provide directions on how to update merger control and assess the role of efficiencies.

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[120]   See footnote 55.

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