Towards Guidelines for
Efficiency Analysis in Mergers and Antitrust Cases

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1. Introduction

It has long been recognized that mergers may give rise to efficiency gains that can reinforce firms' incentives to compete, thereby mitigating or even offsetting their potential negative anticompetitive effects. For instance, a more efficient allocation of production among the firms' plants may lead to significant cost reductions, which may in turn lead to decreases in prices or improvements in the quality of products.

Let us consider two examples. First, the present U.S. rail freight industry is highly efficient and profitable, even though all existing firms are the result of mergers that took place in this industry since its restructuring with the Staggers Act of 1980. To date, all mergers in this industry have been approved thanks to the large efficiency gains that firms were able to exploit when they merged.[1] Second, in the E.U., less than two percent of proposed mergers have been prohibited by the Directorate-General for Competition. It is instructive that these decisions have rarely been overturned by the appeal court, with the Tetra Laval / Sidel case constituting a notable exception. A highly contentious issue behind this ruling was the potential efficiency gains that could spring from new technologies that might develop because of a merger.

These examples, among many others, illustrate the importance of accounting for efficiency gains in merger evaluations, and hence highlight the risk of under- or over-estimating the impact of merger efficiencies.

The issues of how merger regulation should address the question of efficiency, and how it should account for and evaluate efficiency gains, are crucial for all parties involved, namely, the merging firms, third parties and, ultimately, the courts of appeal. When rules are grounded in sound economic arguments and understood by all participants, the risks of

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[1] See for instance Daniel Coublucq (2012): "An econometric Analysis of Productivity in the US Railroad Industry, 1980-2006," mimeo.

approving anticompetitive mergers or prohibiting competitive ones are lowered and the appropriate evaluation of efficiency-related claims requires much less time and effort.

Competition authorities usually follow three steps in evaluating efficiencies during a merger investigation. First, the competition authority decides what constitute efficiency gains that result from a merger, and what do not. Second, based on supporting evidence, the competition authority decides whether or not to validate each of the efficiencies claimed by the merging parties. Several requirements should be cumulatively satisfied for an efficiency to be credited to the merger: it should i) be merger specific ii) be verifiable, i.e., substantiated by reasonable means, and iii) have the potential to offset possible anticompetitive effects that the merger in question may bring about. Finally, whether all, some or none of the claimed efficiencies are credited, the competition authority needs to assess the trade-off between efficiency gains and anticompetitive effects. In other words, it should verify the potential of claimed efficiencies to fully offset possible negative impacts, so that the net effect of the merger is not detrimental to consumers or society in general.

The structure of this report follows the above logic and provides detailed guidance on each step that the competition authority should follow when evaluating efficiencies. It references the best international practices, including, where possible, examples of relevant cases and technical approaches.

Our discussion mainly focuses on efficiencies that may be brought about by horizontal, vertical and conglomerate mergers. However, the efficiency issue can enter the review of any business case that the competition authority may have to handle, notably, any cases involving cooperation between undertakings.[2] We suggest employing this report as a reference document in those cases as well.

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[2] For cases of abuse of a dominant position with claimed efficiencies that have been handled by the European Commission, see the British Airways case (reference # T- 219/99) and the Michelin II case (reference T-203/01). Additional examples and discussions on this issue can be found in Chapter 4 of the OECD report (2012) "Roundtable on the Role of the Efficiency Claims in Antitrust Proceedings."

2. Types of efficiencies

2.1   *Cost optimization*

1. *Economies of scale*

In the short term, economies of scale occur when average costs decline with higher output. In part, this effect appears because fixed costs become spread out over more units of output. A merger can induce this type of cost efficiency if post-merger production is concentrated in a smaller number of plants, or, in the extreme case, in a single plant. Furthermore, economy in variable costs can also be achieved, if, for example, larger scales increase operational efficiency or inputs can be purchased at greater discounts by combining merging firms' input demands. As a result, the same level of output can be produced at lower total costs. Short-term economies of scale can be attained up to a certain production level that is specific to each industry or production technology. Once production exceeds this threshold, average costs start rising again. Therefore, this efficiency gain can only be realized if the production of at least one of the merging firms is below its most efficient level.

In the short run, manufacturing facilities are already in place and it may be very costly to divest them or to reallocate production to achieve economies of scale. In contrast, divesting and reallocating may become more plausible in the long run. As output increases, firms may find it reasonable to invest in new technologies, thereby ensuring lower marginal costs. In the long run, per-unit costs of production may also decrease due to specialization or as a result of 'learning by doing', where experience causes firms' average costs to decline with increased output. Both specialization and 'learning by doing' effects can be achieved without a merger. However, in some cases, a merger may serve as a trigger and facilitate the process by allowing firms to learn from each other's experience, *inter alia* via technology transfers.

Economies of scale are not limited to production; they can also be achieved in other areas, such as R&D, distribution and marketing.

Relevant cases: *XM Satellite Radio / Sirius Satellite Radio (DoJ, U.S., 2008); Asda Stores Limited / Netto Foodstores Limited (OFT, UK, 2010); Dräger Medical AG & Co KGaA /Air-Shields (CC, EU, 2004).*[3]

2. *Economies of scope*

This type of efficiency refers to a reduction in the average costs of production due to an increase in the variety of goods that are manufactured. In the case of mergers, economies of scope have essentially the same sources as economies of scale. For instance, they can be achieved by reallocating the production of differentiated goods between fewer manufacturing plants. Cost reductions may result from the joint use of inputs, from the sharing of production facilities, from proprietary know-how, or from common marketing activities.

Similar to efficiency gains due to scale economies, efficiencies derived from scope economies can only be realized if the output level is below a certain threshold, beyond which the average cost starts to rise again.

Relevant case: *Procter&Gamble / Gillette (Competition Commission (CC), EU, 2005).*

3. *Economies of density*

Economies of density are, in some sense, a particular case of economies of scope that may arise from a more intensive use of a network infrastructure. From a merger perspective, this efficiency type can be achieved if the workload is moved from one merging partner's network to the other's, until its full saturation.

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[3] The appendix provides a short description of cases that are relevant to the different issues addressed in this report, as well as links to relevant references.

4. Disposal of duplicated fixed costs

A merger may lead to the disposal of duplicated fixed costs, e.g. administrative and back office expenditures, marketing, storage facility maintenance, etc. In the case where all production is moved to a single plant, the fixed costs associated with maintaining the closed production facilities would also be eliminated.

Relevant cases: *BHP Billiton PLC / BHP Billiton Limited / Rio Tinto PLC / Rio Tinto Limited (JFTC, Japan, 2010); XM Satellite Radio / Sirius Satellite Radio (DoJ, U.S., 2008); Nucor / Birmingham Steel (DoJ, U.S., 2002).*

5. *Optimization of capital costs*

Consolidation of capital and cash flows may strengthen the financial position of the merged entity. This may result in additional cost savings, as cheaper capital can be attracted.

6. *Rationalization of procurement, production, distribution and servicing*

Higher productivity and/or lower costs can be achieved via the reallocation of production among merging firms' plants.[4] If there is no capacity constraint on the most efficient plant, all output can be centralized, thereby generating fixed costs savings due to the closure of inefficient facilities. With differentiated products, cost reductions or higher productivity can be achieved by concentrating the production of each good in one of the plants, i.e., by specializing each production unit.

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[4] Historical examples of post-merger increases in productivity can be found in the research paper by Lichtenberg F.R. and D. Siegel (1987): "Productivity and Changes in Ownership of Manufacturing Plants", Brookings Papers on Economic Activity, Vol. 3, pp. 643-673. Other examples can be found in McGuckin R. H. and S. V. Hguyen (1995) "Exploring The Role Of Acquisition in the Performance of Firms: Is The "Firm" the Right Unit of Analysis?", Center for Economic Studies of U.S. Census Bureau, Working Papers, 95-13 and McGuckin R. H. and S. V. Hguyen (1993): "On Productivity and Plant Ownership Change: New Evidence from the LRD", RAND Journal of Economics, vol. 2, pp. 257-276.

Similarly, transportation costs can be reduced by utilizing storage facilities more efficiently and/or by moving production to a manufacturing plant closer to consumers.

A merger may also enable the implementation of more efficient procurement, distribution and servicing systems, including greater geographic coverage. This is especially relevant for vertical and conglomerate mergers, which bring complementary assets together. For instance, a merger between a R&D-focused company and a company that is strong in marketing could allow higher quality products to reach consumers faster.

Relevant cases: *Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); IMC Global / Western Ag (Departmenr of Justice (DoJ), U.S., 1997); Verizon / MCI and SBC/AT&T (DoJ, U.S., 2005); PayPal / eBay (DoJ, U.S., 2002); Genzyme / Novazyme (FTC, U.S., 2004); Nucor / Birmingham Steel (DoJ, U.S., 2002); DirecTV / Dish Network (DoJ, U.S. 2002); Whirlpool / Maytag, (DoJ, U.S., 2006); Asda Stores Limited / Netto Foodstores Limited (OFT, UK, 2010); Dräger Medical AG & Co KGaA / Air-Shields (CC, EU, 2004).*

7. *Reduction of managerial slackness*

When management fails to run a company efficiently, it leads to losses in productivity and a deviation from the profit-maximizing state. This internal inefficiency is known as managerial slackness or X-inefficiency. A merger may eliminate managerial slackness if higher management standards are transferred from one merging firm to the other through, for instance, a Key Performance Indicators (KPI) system[5] or a more developed corporate culture (given that the merger allows for the evaluation of managerial performance in both firms).

It is generally unclear how to measure the effect that a reduction in managerial slackness may bring, unless a very detailed KPI system is implemented.

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[5] A KPI system is a way to measure performance. It consists of a set of indicators that are measured over time and compared against defined benchmarks, set according to strategic or/and operational goals. Analysis of these indicators with respect to the corresponding benchmark helps to assess whether goals are met and to identify areas for improvements.

2.2   Impact of conduct of firms

8. *Transaction efficiencies*

Transaction efficiencies arise when a merger improves coordination with either upstream or downstream partners. These efficiencies are especially relevant to non-horizontal mergers, as the alignment of incentives with input providers or distributors helps avoid opportunistic behaviors.

For example, an independent distributor may be unwilling to invest in the promotion of manufactured goods because competing distributors would benefit from this too. A vertical merger may help to resolve this problem because it aligns the incentives within the merged entity to invest in, for example, marketing, infrastructure, and even new products.

Potential transaction efficiencies will be larger if interactions between merging firms are frequent and will be either maintained on the same level or reinforced in future, and/or if they imply the involvement of specialized, transaction-specific assets.

Relevant case: *Avant! / Synopsys, Inc (FTC, U.S., 2002).*

9. *Removal of double marginalization*

When downstream and upstream market players set their prices independently, each market player charges a certain mark-up. Vertical integration (e.g., by means of a merger) may provide incentives for the merged firm to internalize and remove this double mark-up and, as a result, charge a lower price.

However, the post-merger effect on price will be weak if double marginalization is insignificant before the merger, due to, for example, contractual agreements between merging firms or intensive competition that eliminates or restricts distributional or production mark-ups.

Relevant case: *Avant! /Synopsys, Inc (FTC, U.S., 2002).*

10. *Pricing strategy*

When the products of merging firms are complements, then a (conglomerate) merger can provide incentives for merging firms to decrease prices. Lowering prices is a profit maximizing strategy when it results in higher demand for the complementary products. Besides benefiting consumers in terms of lower prices, a conglomerate merger may also guarantee a more homogenous quality level and/or better compatibility of products.

Pricing effects caused by the removal of double marginalization or the bundling of complementary products usually form part of the analysis of anticompetitive effects, and therefore do not require a separate assessment.

Relevant cases: *Global Radio UK/ GCap Media (Office of Fair Trading (OFT); UK, 2008), Verizon / MCI and SBC / AT&T (DoJ, U.S., 2005); Procter&Gamble / Gillette (Competition Commission (CC), EU, 2005)*

11. *Impact on coordinated effects*

A particular anticompetitive effect of a merger is that, with fewer players on the market, the probability of collusion between them increases. However, merger-specific cost reductions may break the symmetry of costs in the industry, thereby giving the merged entity greater economic incentives to deviate from the terms of coordination, and thus decreasing the likelihood of coordination between market players. The anti-collusive effect is even stronger if one of the merging firms is a maverick firm, or if the merged entity is likely to

become one post-merger.[6] A merger may also give merging firms incentives to improve the existing product or create a new one, which could undermine the incentives to coordinate.

2.3 Benefits to consumers

12. *New or improved products, product repositioning*

Mergers may motivate and facilitate the introduction of new products or may result in product repositioning by both merging and non-merging firms. Where product attributes are affected and substantial quality improvements are brought about, it could be misleading to consider only pricing effects.[7] For example, a merged entity may decide to increase the differentiation between produced goods in order to decrease the cannibalization among them.[8]

The assessment of the final effect that a new product or changes in product attributes would have on prices and consumers' welfare requires a comprehensive analysis. The net effect can be either positive or negative.

Relevant cases: *Google Inc. / BeatThatQuote.com Ltd (OFT, UK, 2011); Directories / GoudenGids (NMa, Netherlands, 2008); Genzyme/Novazyme (FTC, U.S., 2004); Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); Asda Stores Limited / Netto Foodstores Limited (OFT, UK, 2010); Avant! /Synopsys, Inc (FTC, U.S., 2002).*

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[6] A maverick firm is a firm with a different, usually aggressive, competitive strategy. In practice it is often hard to know if the merger is going to create a maverick firm. Some helpful ideas on the issue can be found in a note by T.M. Owings (2013): "Identifying a Maverick: When Antitrust Law Should Protect a Low-Cost Competitor," 66 *Vanderbilt Law Review,* Vol 66, No. 1.

[7] See, for instance, Mazzeo, M., K. Seim and M. Varela: (2013), "The Welfare Consequences of Mergers with Product Repositioning," mimeo.

[8] Market cannibalization refers to a situation in which a product 'eats' or 'draws' a share of the demand from another product that is produced by the same firm.

13. *Network effects*

Network effects arise when consumers value the network or platform that provides a service more when it is used by a greater number of consumers. Examples include landline and mobile telephone services – the greater the number of subscribers that can be reached, the higher the value of this service for each person. Therefore, if a merger between two networks creates a larger network with more users, it may benefit all consumers. This is the potential direct network effect of a merger.

A merger may also be associated with a negative indirect network effect. If pre-merger networks were tied with different complementary products or services, then some consumers could be forced to switch from one to another after the merger. Thus, a merger may benefit one group of consumers and hurt others.

Relevant cases*: Google Inc. / BeatThatQuote.com Ltd (OFT, UK, 2011); Directories / GoudenGids (NMa, Netherlands, 2008); PayPal / eBay (DoJ, U.S., 2002).*

14. *One-stop shopping*

An additional efficiency can arise on the demand side when the products of merging firms are complements, e.g., in the case of a vertical or conglomerate merger. Consumers may then reduce their transaction costs by buying a bundle of products from a single supplier. This is the so-called 'one-stop shopping' effect. It can be understood as a sort of economies of scope in purchasing.

Relevant cases*: Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); Procter&Gamble / Gillette(Competition Commission (CC), EU, 2005).*

2.4 *Optimization of R&D activities*

Combining merging firms' financial resources may both increase the amount of funds available for R&D and provide greater incentives for the merging firms to invest in R&D programs.

If the merged entity is expected to be more stable in financial terms, it may get better access to capital markets or be able to borrow at a lower rate. It may also choose to decrease its requirement on expected returns, thereby allowing it to pursue a wider range of research activities. Furthermore, the merged entity may find it reasonable to pay for a research tool that would have been too expensive for the individual firms. Greater financial capacity may also put the merged entity in a better position to create or reinforce its intellectual property (IP) portfolio, and in this way enhance its incentives to innovate.

Post-merger joint exploitation of intellectual property could lead to a diffusion of know-how that may eventually result in lower production costs, improved product quality, and/or the creation of new products. In practice, IP rights can also be exploited via a licensing agreement, but this is not always convenient for firms, so that, in some cases, common ownership through a merger constitutes the more appropriate alternative.

Furthermore, a merger may allow firms to combine complementary technological and research skills and assets, which may lead to greater innovation. For example, one of the merging firms could benefit from an asset of the other firm that would otherwise have been too expensive to buy. Another possibility is that two firms that often interact in the research domain on the basis of complementary R&D assets may find it reasonable to reduce transaction costs by merging.

When merging firms are pursuing similar research objectives, diversification can lead to a better spreading of risk, and the merged entity may have a greater incentive to fund R&D

projects. If research programs are duplicating each other, then certain cost savings can be achieved by eliminating identical projects. However, the competition authority should be certain that research programs are indeed duplicating each other. Otherwise, there is a risk that the eliminated program could have been more successful than the continued program, which might reduce the probability of successful innovation.

While a merger offers numerous potential benefits in the R&D domain, negative effects are also possible. For instance, if competition between the merging firms was the main force driving innovation in the past, then a merger between them may significantly reduce their incentives to conduct research.

Relevant cases: *Dräger Medical AG & Co KGaA / Air-Shields (CC, EU, 2004), Genzyme/Novazyme (FTC, U.S., 2004); Genzyme / Ilex (Federal Trade Commission (FTC), U.S., 2004).*

2.5   Cost savings and other gains that are not considered efficiencies

Competition authorities are not expected to recognize efficiency gains that result from the realization of anticompetitive actions. Therefore, savings that arise from a decrease in output or a reduction in the variety or quality of products cannot be qualified as an efficiency gain. For instance, cost savings that are associated with the elimination of duplicative call–centers, cannot be recognized as an efficiency gain if their elimination reduces the quality of service, e.g., due to an increase in the hold/queue time.

Also, gains that result from an increase in bargaining power, e.g., in the form of discounts from suppliers *that are not cost-justified*, are not recognized as efficiencies because they are nothing more than a transfer of wealth from suppliers to the merged entity. In contrast, more beneficial procurement contracts, e.g., due to discounts on greater volumes ordered by the merged entity, will be validated.

3. Requirements

To be recognized by the competition authority and taken into account in the merger assessment, efficiencies that are claimed by merging parties should cumulatively satisfy the following requirements: i) merger-specificity, ii) verifiability, and iii) potential to offset the expected anticompetitive effects of the merger. Efficiencies should be net of the costs incurred in achieving them, as well as of the costs associated with implementing the merger.

3.1   *Merger- specificity*

The competition authority only credits those efficiencies that can be achieved through the proposed merger and are unlikely to be achieved without it. In other words, if an efficiency can be accomplished without the merger or by means of a less anticompetitive business practice than the merger - such as technology licensing, joint ventures in production or R&D, joint purchasing agreements, or even another merger - it will not be credited.

When an efficiency can be achieved through an alternative business arrangement or through internal means, it should nevertheless not be categorically excluded from the analysis. The U.S. Commentary on the Horizontal Merger Guidelines (2010) states that "if there are some alternatives but they are costly or impractical, then an efficiency can still be considered as merger-specific." Observing the regular practices of other firms in the same or similar markets can provide some evidence on the feasibility of possible arrangements. The verification of merger-specificity therefore requires an assessment of the anticompetitive effects and the costs of implementing possible alternative business practices that could deliver similar efficiencies.

If a merger is associated with cost reductions that result from the adoption of a 'best practice' by the merging firms at a time when other firms are adopting similar practices, then

the claimed efficiencies cannot be categorized as merger-specific. However, if the corresponding practice falls within the scope of intellectual property rights, then merger-specificity can potentially be established. In this context, some difficulties may arise in proving the merger-specificity of the removal of managerial slackness. The main reason is that firms are generally able to improve their managerial standards without merging. Besides, the removal of the competitive tension between merging firms may in some cases decrease their incentives to improve the quality of their management. However, exceptions are possible. If the managerial standard or KPI system that will be transferred from one merging partner to another is considered to be effective and represents a 'know-how' that is not available to any other competitor, then this efficiency can potentially be attributed to the merger.

In this respect, timing may also play an important role. For example, efficiencies can be considered as merger-specific if the proposed merger accelerates their accomplishment.

Relevant cases: *Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); IMC Global / Western Ag (Departmenr of Justice (DoJ), U.S., 1997); Verizon / MCI and SBC/AT&T (DoJ, U.S., 2005); Genzyme / Novazyme (FTC, U.S., 2004).[9]*

3.2   Verifiability

The merging entities are usually best informed about the potential benefits that a merger may bring. Yet, it is in their interest to overestimate the potential pro-competitive effects in their claims of efficiency gains, as it may have a positive impact on the competition authority's final decision regarding the proposed merger. Accordingly, the competition

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[9] Some examples of cases where merger-specificity was not established include: Heinz / Beech-Nut (FTC, U.S., 2000); BHP Billiton PLC / BHP Billiton Limited / Rio Tinto PLC / Rio Tinto Limited (JFTC, Japan, 2010).

authority seeks to credit only efficiencies that are not speculative or vague, i.e., that can be verified by reasonable means.

Particularly, the merging parties should explain in detail how the proposed merger would enable efficiencies to materialize, and provide indications of their magnitude, likelihood and timing. Explanations should include anticipated activities, as well as estimation of the associated risks. Where possible, efficiencies should be quantified and a detailed, robust explanation of how the quantification was performed should be offered. The costs of achieving those efficiencies should also be reported.

Supporting evidence may include various internal documents, such as accounting statements, strategic and integration plans, managerial statements to the owners, etc. The competition authority may also require physical access to certain facilities of the merging firms. External expertise, such as management consultant studies or contributions from industry experts, can also be helpful in assessing both the feasibility of the claimed efficiencies and the extent to which they could benefit consumers. Much can be learned from historical examples of mergers in similar markets. The similarity between markets can be judged on the basis of product features, cost and demand characteristics, barriers to entry, and, eventually, the degree of competition and concentration.

Econometric estimation of cost functions can provide evidence on economies of scale and/or scope, on cost complementarities among products, and on the efficient size of firms.[10] The drawback of this approach is that it requires an extensive dataset on input prices and output quantities. However, even simple cost functions, estimated on a more limited dataset, can provide useful insights into the economic description of the technology of merging firms.

Some claimed efficiencies are harder to substantiate than others. For instance, various cost reductions due to economies of scope and scale are more likely to be cognizable. In contrast, while efficiencies related to innovation can potentially have a more substantial

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[10] See, for instance, Greene, W.H. (2008), *The Econometric Approach to Efficiency Analysis*, Oxford University Press.

welfare effect, they are usually less easily verified. These efficiencies are more likely to be recognized if a specific complementary asset is required for their realization, such as, for instance, IP rights that are necessary to produce a new product. Another example would be a merger involving a large, financially strong company that wants to unite with a small research-oriented firm, because the company understands the smaller firm's potential and is willing to invest in its projects.

The competition authority may choose to credit only those efficiencies that were proven to have a high probability of realization. Alternatively, it may decide to apply weights to take into account the risk that some efficiencies may never be realized or will only be implemented in the long term.

Relevant cases*: Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); IMC Global / Western Ag (Department of Justice (DoJ), U.S., 1997); Whirlpool / Maytag, (DoJ, U.S., 2006); Asda Stores Limited / Netto Foodstores Limited (OFT, UK, 2010).[11]*

3.3   Offsetting effect

Potential efficiencies often represent a basis for mergers because of their ability to provide significant competitive advantages for the merging parties. However, they do not necessarily benefit all interest groups involved. While merging parties may enjoy significant cost savings, reduced competition may result in higher prices or lower quality levels that harm consumers.

As a general principle, the mere presence of efficiencies, even substantial ones, almost never justifies a merger that could bring about significant anticompetitive effects. The

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[11] All, or a significant part, of the claimed efficiencies were not substantiated in the following cases: Dräger Medical AG & Co KGaA / Air-Shields (CC, EU, 2004); BHP Billiton PLC / BHP Billiton Limited / Rio Tinto PLC/ Rio Tinto Limited (JFTC, Japan, 2010).

competition authority seeks to evaluate the net effect of the merger, i.e., the balance between pro- and anti-competitive impacts. It will therefore only credit efficiencies that have the potential to mitigate or fully offset the possible negative consequences of the merger.

The net effect of a merger is usually measured either in terms of prices or in terms of welfare changes, depending on the welfare standard the competition authority adopts. Whether a certain type of efficiency will be credited to the proposed merger depends heavily on this standard, because a merger's impact on prices can be very different from its impact on welfare. This report does not articulate any a priori preferences towards any type of efficiency. The competition authority should judge and act according to its chosen welfare standard.

When the competition authority focuses mostly on pricing effects, the removal of double marginalization or downward pricing effects in conglomerate mergers have a higher probability of being taken into account. Unlike other types of efficiency, they do not require any competitive pressure to pass the efficiency gains through to customers, because, independent of any rivalry, lowering prices is a profit maximizing strategy for the merging firms. Besides, the evaluation of pricing effects constitutes part of the analysis of anticompetitive effects.

Various reductions in variable costs also have a great chance of being credited, as they directly affect the pricing strategy and are therefore more likely to benefit customers in the short term. The extent to which prices will react to changes in variable costs largely depends on the pass-through rate experienced by merging firms.[12] There is no standard pass-through rate that can be applied in every case. In each case, its estimation would require a careful examination of the market in question. Ready-to-use estimates, as well as the information necessary to perform the estimation of the pass-through rate, can be collected from various sources, such as industry-related reports, consumer surveys and other empirical studies.

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[12] For instance, a pass-through rate of 10% would mean that the price would decrease by 1% as a result of a 10% drop in marginal or per-unit costs.

Historical data from the same industry can also be useful if information on price dynamics and delivered cost efficiencies is available. Otherwise, a comprehensive econometric study can be performed to estimate the firm-specific pass-through rate based on the data provided by the merging parties. When no relevant market- or firms-specific data are available, references could be made to the pass-through rate in similar markets.

The degree of pass-through is influenced by many factors, such as the shape of demand and cost curves. For instance, the market is likely to experience substantial pass-through if marginal costs increase significantly with output, e.g., in the presence of a capacity constraint. By lowering their prices, firms could be able to sell even more, and by doing so, they could increase their profits while the constraint in terms of increasing marginal costs become less binding.

The shape of the firm's demand curve can also be informative about the extent to which cost reductions translate into lower prices. Pass-through is expected to be high when demand is more sensitive to price changes, i.e., more elastic at lower prices. When a firm enjoys a margin between price and marginal costs and faces elastic demand, a drop in costs makes it profitable to decrease the price and sell a lot more output, even if per-unit margins decrease slightly.

Another factor that impacts on the pass-through ratio is the total demand elasticity. A high demand elasticity is associated with consumers finding it easy to switch from one product to another and being prone to leave the market when the price rises, leading to fierce competition between firms, and low margins. On a perfectly competitive market, the price is equal to marginal cost. In this case the pass-through rate is 100 percent because any drop or rise in costs is automatically reflected in prices. Less competitive markets exhibit more moderate pass-through.

In contrast to reductions in variable costs, fixed cost savings will normally be excluded from consideration, as they do not explicitly influence price formation, but rather represent

private gains of the merging parties. However, exceptions are possible. For instance, fixed cost levels may affect the pricing strategy in the short-term if prices are set on a 'cost-plus' basis, e.g., via a tendering process, where bids reflect both the fixed and variable costs. In practice, classifying costs as fixed or variable may be difficult, partly because the classification is significantly influenced by the chosen time horizon.

Under a more general consumer welfare standard, the competition authority does not only consider efficiencies that affect price levels, but also those that pertain to quality improvements or positive network effects, among other things. For instance, the European Commission Guidelines on the assessment of horizontal mergers state that "the relevant benchmark in assessing efficiency claims is that consumers will not be worse off as a result of the merger"[13] Fixed-cost savings can therefore play an important role in the analysis if they benefit consumers in the long run. This may be the case if these savings are invested in R&D projects, thereby creating additional value in the form of new and/or improved products, or if they are invested in a new technology that results in lower prices. These considerations are appropriate for many innovation-driven industries, such as the information technology and pharmaceutical industries.

If the competition authority adopts the total welfare standard (the sum of consumers' and producers' surpluses), then fixed-cost reductions and other merger-related efficiencies that benefit merging entities, but are not necessarily passed on to consumers, will be factored into the analysis unconditionally. This standard is employed, for example, by the Canadian Competition Bureau.

Ultimately, the competition authority may choose to apply weights to different efficiencies that depend on the specific welfare standard employed in the merger assessment.

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[13] EC Guidelines on the assessment of horizontal mergers under the "Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings", paragraph 79. The full text can be found at http://ec.europa.eu/competition/mergers/legislation/regulations.html.

The past experiences of merging firms or other firms on the market can provide some insight into the ability of the claimed efficiencies to offset the possible anticompetitive effects of a merger (in terms of either downward pricing effects or more general welfare improvements). A detailed plan that demonstrates the offsetting mechanism can also be helpful. In general, because of the uncertainty associated with long-term improvements, competition authorities place the most weight on short-term effects. Requirements related to the substantiation of the offsetting effect are covered in section 3.2 of this report.

Relevant cases*: Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); IMC Global / Western Ag (Departmenr of Justice (DoJ), U.S., 1997); Verizon / MCI and SBC/AT&T (DoJ, U.S., 2005); Genzyme / Novazyme (FTC, U.S., 2004); XM Satellite Radio / Sirius Satellite Radio (DoJ, U.S., 2008). Offsetting effect was not demonstrated in the following cases - Gencor/Lonrho (CC, EU, 1996), BHP Billiton PLC/BHP Billiton Limited /Rio Tinto PLC/ Rio Tinto Limited (JFTC, Japan, 2010).*

3.4   Other important remarks

15. *Burden of proof*

The majority of advanced jurisdictions around the world place the burden of substantiating claimed efficiencies upon the merging entities.[14] Supporting evidence should

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[14] The U.S. Horizontal Merger Guidelines (2010) state that "parties have the burden on any efficiencies claim (Guidelines § 0.1 n.5), and it is to their advantage to present efficiency claims (including supporting documents and data) to the reviewing Agency as early as possible." The E.U. Horizontal merger Guidelines under the "Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings" (paragraph 87) reads that it is the role of the "incumbent upon the notifying parties to provide in due time all the relevant information necessary to demonstrate that the claimed efficiencies are merger-specific and likely to be realized. Similarly, it is for the notifying parties to show to what extent the efficiencies are likely to counteract any adverse effects on competition that might otherwise result from the merger, and therefore benefit consumers." The Canadian Merger Enforcement Guidelines point out that "the parties' burden includes proving that the gains in efficiency […] are likely to occur […] are brought about by the merger or proposed merger (i.e., that they are merger-specific) […] are greater than and offset the anti-competitive effects."

cover all aspects, including merger specificity, verifiability and potential for the offsetting effect.

There are several justifications for this allocation of the responsibility. The first is an informational asymmetry due to the fact that often only the merging parties possess the knowledge of business processes and the information required to support their efficiency claims. It may furthermore be difficult for the competition authority to verify claims with third parties, e.g., suppliers, distributors or competitors, since they may have an incentive to undermine the claims if they expect the merger to be damaging for them.

Because the offsetting effect has to be demonstrated, the competition authority should assist merging parties by providing all necessary details concerning the assessment of anticompetitive effects.

Evidence that can support efficiency claims may often be incomplete or, even worse, not available at all. In this respect, merging parties should be subject to a standard burden of proof that is not higher than the one employed by the competition authority for the assessment of anticompetitive effects.

Since the verification process may necessitate the exchange of sensitive business information, the competition authority should take appropriate measures to avoid that the exchange facilitates collusive behavior between merging parties in the case of the proposed merger not being authorized to proceed. At the same time, the competition authority should not create immoderate obstacles that could undermine the process of substantiation. With respect to this point, the U.S. Horizontal Merger Guidelines of 2010 state that "information exchanges reasonably related to due diligence and integration planning that are accompanied by safeguards that prevent any other pre-merger use of that information are unlikely to be unlawful. The competition authorities are mindful of parties' need to provide sensitive efficiencies-related information and, in that vein, the agencies note that the antitrust laws are flexible enough to allow the parties to adopt reasonable means to achieve that end lawfully."

16. *Interrelated markets*

As highlighted above, merger effects are assessed with respect to the welfare standard adopted by the competition authority. Under a general consumer welfare standard, efficiencies that arise outside of the relevant market should be appreciated as much as those arising within it. A competition authority may therefore decide to take into account beneficiaries in related markets, especially when the related market is bigger. With some restrictions, this principle applies in the UK and in the US. This approach is also adopted by the Canadian Competition Bureau, which does not, however, credit efficiencies achieved outside of Canada.

It may sometimes be the case that consumers in one market benefit from a merger, while consumers in another market are made worse off. This has called the fairness of the interrelated markets approach into question. Therefore, some competition authorities consider the claimed efficiencies only with respect to the most immediate market and its agents. For instance, E.U. Merger Guidelines state that "efficiencies that only offset the harm suffered by consumer groups that are adversely affected by the restrictive agreement will be credited."

Relevant cases: *Genzyme / Ilex (Federal Trade Commission (FTC), U.S., 2004); Gai's / United States Bakery (DoJ, U.S., 1996).*

17. *Dynamic aspect*

Certain types of efficiency, especially those related to innovation, may become effective only in the long run. They are usually called 'dynamic efficiencies'. While variable-cost savings provide direct incentives for firms to lower prices, recurrent fixed-cost savings may reinforce

innovative processes and allow the merged entity to enter new markets, introduce new products, or significantly improve the quality of existing ones, in the long run. Because the effect from dynamics efficiencies occurs over time the potential long-term impact can be much higher than instantaneous cost reductions.[15]

In a capital-intensive or IT/software industry, the meaning of short-term marginal costs is very limited, while long-term savings can be significant. Ignoring these benefits may result in misleading predictions concerning a merger's long-term impact on consumer welfare.

In some industries, innovation has a higher probability to occur if merging firms acquire a monopolistic (or dominant) position. To recoup R&D expenses, merging firms might charge a supra-competitive price for some time. Innovation-driven industries, such as IT and healthcare, serve as examples. Thus, even if the pricing strategies can be harmful to consumers in the short term, efficiencies coming from new products or technologies may arrive in the longer term and offset the negative pricing effect. Therefore, a competition authority may face the problem of measuring the trade-off between short-term price increases and long-term positive effects that result from dynamic efficiencies.

Dynamic efficiencies are often of a non-pricing nature. Uncertainty around an innovation's cost, timing, likelihood and eventual effect on quality, make dynamic efficiencies hard to quantify. Where it is possible to quantify future efficiency gains, a discount rate should be applied to take into account the monetary value of time and the risk that the efficiency gains are never realized.

Relevant cases: *Genzyme / Novazyme (FTC, U.S., 2004;, Genzyme / Ilex (Federal Trade Commission (FTC), U.S., 2004)*

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[15] Historical examples of significant dynamic efficiencies in the pharmaceutical industry can be found in a paper by Ornaghi C. (2009): "Mergers and innovation in big pharma," *International Journal of Industrial Organization*, vol. 27(1).

4. Assessment

4.1 Sufficiency

For a given welfare standard, the competition authority has to two tasks: investigate whether efficiencies shall be credited to the merger and evaluate whether these efficiencies are *sufficient* to offset the relevant post-merger anticompetitive effects.

When a merger assessment does not reveal any significant anticompetitive effects, then an efficiency defense might not be necessary.[16] If, on the other hand, significant harm to consumers is anticipated, then the competition authority must evaluate whether this harm can potentially be mitigated by merger-generated efficiencies. Possible approaches to establishing the sufficiency of efficiencies, as well as some relevant techniques for doing so, are provided below.

The task of the competition authority is not simply to compare the magnitudes of those effects, but rather to investigate whether credited efficiencies are *sufficient* to *fully eliminate* the *relevant* post-merger anticompetitive effects. The inclusion of the word 'relevant' reflects the fact that the definition of sufficiency strongly depends on the welfare standard adopted by the competition authority.

Under the price standard, these efficiencies should be large enough to prevent the price increase from exceeding the established tolerance threshold (for instance, 5%). In the extreme case where no price increase is tolerated, the competition authority will consider efficiencies as sufficient only if they motivate merging parties to maintain pre-merger prices or lower prices.

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[16] For example, the Toppan / DuPont merger case (DOJ, U.S., 2005) was not challenged because of small anticompetitive effects, and therefore no efficiency claims were necessary for the merger to be approved.

Note, however, that post-merger price increase can be consistent with welfare improvements. For instance, if merging entities improve the quality of existing products or introduce new ones, or if more efficient, non-merging firms significantly expand their output in response to these price increases, consumers might benefit despite higher prices.[17] By using consumer welfare or total welfare standards, efficiencies may therefore be found to be sufficient even if they do not feature price reductions. The Superior Propane / ICG Propane merger was the first case in Canada that, despite being found to be anticompetitive in terms of pricing effects, was eventually approved because offsetting efficiencies increased total welfare.

There are many other merger cases on record, assessed under a consumer welfare standard, in which the efficiency defense played a significant, if not decisive, role. The list is only growing.

Relevant cases: *Global Radio UK / GCap Media (Office of Fair Trading (OFT), UK, 2008); IMC Global / Western Ag (Departmenr of Justice (DoJ), U.S., 1997); XM Satellite Radio/Sirius Satellite Radio (DoJ, U.S., 2008); Whirlpool / Maytag, (DoJ, U.S., 2006); Superior Propane Inc. / ICG Propane Inc. (Competition Bureau, Canada, 2003).[18]*

4.2 Assessing the sufficiency of efficiencies in practice

When quantifying the credited efficiencies is deemed feasible, there are two ways of assessing their sufficiency:

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[17] Some theoretical illustrations of this effect can be found in Farrell J. and C. Shapiro (1990): "Horizontal Mergers: an Equilibrium Analysis", American Economic Review, Vol.1, pp. 107-26, or in Werden G. J. and L. M. Froeb (1994): "The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger policy", Journal of Law, Economics and Organization, Vol. 2, pp.407-26.

[18] Sufficiency of claimed efficiencies was not established in the following case: DirecTV / Dish Network (DoJ, U.S. 2002), Avant! / Synopsys, Inc (FTC, U.S., 2002).

i. One can estimate the *minimal level of efficiencies* (MLE) that would admit countervailing relevant anticompetitive effects. If credited efficiencies are larger than the MLE-benchmark, then they could be considered sufficient;

ii. Alternatively, an 'integrated' approach can be employed by means of simulation. Such methods incorporate the credited efficiencies directly into the analysis, thereby assessing the net effects of the merger. Efficiencies can be seen as sufficient when the net effects are positive (or neutral) with respect to the adopted welfare standard.

Which of the two methods is superior depends on many factors, and the choice of method should be made on a case-by-case basis. Strict time constraints and limited data restrict this choice in practice. While both approaches may employ a full merger simulation, the 'benchmark' method takes advantage of a range of relatively simple formulae to calculate the MLE, a technique that significantly relaxes the time and data requirements. Of course, the proposed approaches are not equally appropriate for all types of efficiencies. For instance, the removal of double marginalization is hard to assess outside an integrated approach, while a 'benchmark' approach is usually more convenient for addressing variable or marginal cost efficiencies. The eventual decision should be driven by the competition authority's assessment of which types of efficiencies are likely to have the most significant effects.

The chosen assessment technique should satisfy the following requirements:

a. Measurements should be made in units compatible with both estimates of anticompetitive effects and credited efficiencies, for ease of comparison;

b. The chosen technique should provide a clear link to the key merger assessment parameters set according to the welfare standard, such as prices and/or welfare;

c. Sufficient evidence should be available to verify that any assumptions that are made are realistic. In the absence of supporting evidence, the robustness of the obtained results should be verified by using different assumptions, or by varying the level of the input parameters.

Some existing techniques for assessing the sufficiency of claimed efficiencies are provided below. 'MLE-benchmark' approaches, which are less demanding in terms of data, are presented first. Unless otherwise specified, the proposed techniques are relevant when the competition authority adopts a welfare standard that requires prices not to increase post-merger. We complete the section with some possible applications of the merger simulation.

Minimal Level of Efficiency (MLE) based on the expected price change

The simplest way to define the MLE involves estimating the post-merger price increase that would obtain in the absence of efficiencies. If the estimated price change due to the merger is negative, then there is no need to consider efficiencies: we therefore assume hereafter that the expected price change is positive. In other words, we are considering cases in which, absent efficiencies, the proposed merger is expected to be detrimental for consumers. Given that a shift in marginal or variable costs would directly affect the firms' optimal pricing strategy, one can seek to determine by how much costs must decrease in order to maintain prices at their pre-merger levels.

The answer largely depends on the pass-through rate. Supposing that post-merger prices would rise by 5%, then a pass-through rate of, for instance, 50% would require a minimal drop in marginal or per-unit costs of 10% in order to maintain the original price level. This 10% threshold is the MLE benchmark.

More formally, denoting by Δp the expected change in price and by σ the pass-through rate, then the MLE is obtained as:

$$MLE = 100 \frac{\Delta p}{\sigma} \qquad (1)$$

An obvious advantage of this approach is its simplicity: the estimation of the MLE requires a very limited amount of information. Since the assessment of pricing effects constitutes a compulsory part of any merger assessment procedure, this test might be considered a practical benchmark, a safe harbor or a first approximation. Nevertheless, it has several evident drawbacks.

The formula above does not differentiate between firms; however, not all firms on the market experience the same pass-through rate. Ideally one would estimate firm-specific pass-through rates, or even product-specific rates, in the case of multi-product firms. These estimations could significantly complicate the implementation of the MLE approach.

MLE in a market with homogeneous goods

If the goods on the relevant market are considered as homogenous, and if the market comprises single-product firms with a unique market price, then the following technique can be applied.

Let A and B be two firms that are about to merge. Pre-merger state is characterized with a (single) price *P* and pre-merger marginal costs mc_A and mc_B (of firms A and B respectively), such that $mc_A \leq mc_B$. By mc_M we denote the marginal costs of the merged entity. The merger allows for some cost efficiencies, such that $mc_M \leq mc_A \leq mc_B$. Hence, $(mc_A - mc_M)$

and $(mc_B - mc_M)$ represent firm-specific cost efficiencies that come into effect after the merger.

A merger would result in a price decrease if and only if:[19]

$$mc_A - mc_M \geq MLE_A = P - mc_B \qquad (2)$$

The right-hand side of Inequality (2) provides a threshold for firm A above which a decrease in marginal costs of firm A can be considered as 'sufficient'. This threshold is the MLE with respect to firm A. Because $mc_A \leq mc_B$, efficiencies delivered by the firm B, $(mc_B - mc_M)$, should be no smaller than those required for the firm A.

An alternative interpretation of Inequality (2) is that it provides the range of mc_M over which prices will decrease post-merger, i.e.,

$$mc_M \leq mc_A + mc_B - P . \qquad (3)$$

Instead of considering the cost efficiencies on each firm individually, it might be more convenient to simply justify that the post-merger marginal costs are low enough.

Inequality (2) suggests that the higher the markup of firm B, the higher the required efficiencies for firm A. Post-merger, when firms A and B decide on pricing together, a higher markup of one of the merging partners incentivizes the other partner to increase its price. Even if the price increase causes some consumers to switch from product A to product B (or

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[19] This MLE derivation with the corresponding model design and assumptions are taken from Farrell J. and C. Shapiro (1990) "Horizontal Mergers: an Equilibrium Analysis", American Economic Review, Vol.1, pp. 107-26.

vice versa), profits nevertheless increase because the diverted sales stay within the merged entity.

While it is relatively easy to track the price level, the estimation of marginal costs can be a very challenging task - even with a deep knowledge of business processes and access to all the relevant internal documentation. Marginal cost represents the production cost of the next unit of output. In general, these costs correspond to neither average variable cost nor average total cost. Variable and average costs can be retrieved relatively easily from financial statements and other accounting data; however, using them as an approximation of marginal cost is only admissible when all these per-unit variables are constant. If data constraints are relaxed, marginal costs can also be deduced through the estimation of cost functions.

An alternative representation of Inequality (2), using different input variables, is:

$$mc_A - mc_M \geq MLE_A = \frac{s_B}{\varepsilon - s_A} mc_A,$$
(4)

where ε is the market-level demand price elasticity (which measures the shift in total demand (in percent) due to a one percent change in price) and s_A and s_B are the pre-merger market shares of firms A and B respectively.

Intuitively, the higher is the demand elasticity, the stronger is the competitive pressure of the market. When demand is highly elastic, it is natural to expect a moderate post-merger price increase and, therefore, a lower level of efficiency gains would be required.

Intuitively, higher demand elasticity entails stronger competitive pressure on the market. When demand is highly elastic, it is natural to expect a relatively moderate post-merger price increase, and therefore a lower level of efficiency gains would be required. Market share is commonly used as an indicator of market power, i.e. a firm's ability to raise prices above

marginal costs. This provides some intuition to the positive dependence between the minimal efficiency threshold and the market shares of the merging parties. The condition expressed in (4) implies that, if the merged entity occupies such a large market share that $s_A + s_B > \varepsilon$, the merger will never result in lower prices, even if marginal costs were to drop to zero.[20] Notice that, as the sum of market shares is smaller than one, this condition can only hold for inelastic demands. When demand is inelastic, firms can in principle raise prices to such an extent that almost unlimited efficiencies would be required to offset this anticompetitive effect.

MLE in a market with differentiated goods

The MLE approach is recommended for markets with single-product firms that produce differentiated products.

Again, let mc_A and mc_B be the pre-merger marginal costs of merging firms A and B respectively. Because products are differentiated, post-merger marginal costs (denoted as mc_A^m and mc_B^m) and prices may not in general be equal for both firms.

In this case, the MLE condition is stated as follows.[21] A merger will result in a decrease of the price for product A (symmetrically for product B) if and only if:

$$mc_A - mc_A^m \geq MLE_A = \frac{D_{BA}\left(1 + D_{AB}\right)}{\left(\varepsilon_{AA} - 1\right)\left(1 - D_{AB}D_{BA}\right)} mc_A, \tag{5}$$

[20] This remark was first made by Roller L.-H., J. Stennek and F. Verboven (2000) "Efficiency Gains from Mergers", Wissenschaftszentrum Berlin (WZB), CIG Working Papers, #FS IV 00-09.

[21] See Roller L.-H., J. Stennek and F. Verboven (2000) "Efficiency Gains from Mergers", Wissenschaftszentrum Berlin (WZB), CIG Working Papers, #FS IV 00-09.

where ε_{AA} and ε_{BB} are demand elasticities, and where D_{AB} and D_{BA} are diversion ratios. First, note that, because products are differentiated, demand price elasticities are product-specific. Second, the diversion ratio D_{AB} (analogously, D_{BA}) represents the fraction of product A that is lost to product B as the result of the increase in the price of product A.. In other words, a diversion ratio measures the intensity of competition between merging firms. If the diversion ratio is high, then a merger would significantly reduce competition and thus more efficiency gains would be required to offset anticompetitive effects.

This test is general and does not require specific knowledge about how products are differentiated. Nevertheless, the calculation of MLE proposed in (5) is data demanding, as it requires a set of demand elasticities, diversion ratios and marginal costs. In practice, diversion ratio estimates can be based, for instance, on measures of substitution patterns obtained from 'won-lost' reports, consumer surveys, or internal business documentation. Natural experiments are also an option.

The diversion ratio for product A can be calculated as $D_{AB} = \dfrac{\varepsilon_{AB}}{\varepsilon_{AA}}$ where ε_{AB} is the cross price demand elasticity: the sensitivity of demand for product A with respect to the change in price of product B. When cross-price elasticities cannot be estimated, the diversion ratio can be approximated as $D_{AB} = \dfrac{s_B}{1 - s_A}$.[22] Then the MLE condition in (5) becomes:[23]

$$mc_A - mc_A^m \geq MLE_A = \frac{s_A}{(\varepsilon_{AA} - 1)(1 - 2s_A)} mc_A. \qquad (6)$$

[22] This approximation was initially proposed by Willig, R. (1991) "Merger Analysis, Industrial Organization Theory, and Merger Guidelines", Brookings Papers on Economics Activity, 281-332. Theoretically it is valid for demand systems associated with preferences approximated by the logit model.
[23] Derivation of MLEs in (4) or (5) requires that all own and cross-price demand elasticities remain constant regardless the prices. If, as in the general case, elasticities are increasing with prices, then the above formulas overestimate the levels of required efficiency.

The required elasticities can be found in industry reports or related consumers surveys, or they can be estimated through econometric models.[24] Econometric estimation would normally require historical data on the merging firms' market shares and prices, as well as some market-level parameters that drive the industry dynamics.

MLE based on the UPP test

Merger guidelines in the U.S. and Sweden propose to use the value of diverted sales from one merging firm to the other as an informative indicator of potential pricing effects of the merger. This value can also serve to define the MLE.

Multiplying the per-unit profit ('markup') made on a product by the percent of diverted sales, i.e., the diversion ratio, yields the value of diverted sales in money terms. The higher the value of diverted sales, the stronger are the merged firm's incentives to increase its price. Post merger losses in sales can be profitably compensated by increased sales of the partner's product, because diverted sales stay within the merged entity. This principle is employed in the newly designed Upward Pricing Pressure (UPP) test, aimed at assessing the possibility of anticompetitive pricing effects of mergers.[25]

The UPP index for the firm A can be calculated as follows (similar for the firm B):

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[24] Estimation of elasticities for the automobile market can be found in, among others, Bresnahan T. (1981) "Departures from marginal-cost pricing in the American automobile industry : Estimates for 1977-1978", Journal of Econometrics, Elsevier, vol. 17(2), pages 201-227, as well as in Berry, S., J. Levinsohn, and A. Pakes (1995) "Automobile Prices in Market Equilibrium", Econometrica, 63(4), 841-890 and Verboven F. (1996) "International Price Discrimination in the European Car Market", The RAND Journal of Economics, Vol. 27, No. 2, pp. 240-268. For the ready-to-eat cereal industry see Nevo A. (2001) "Measuring Market Power in the Ready-to-Eat Cereal Industry", Econometrica, Vol. 2, pp. 307-42. For the beer industry see Hausman J., G. Leonard and J.D. Zona (1994) "Competitive Analysis with Differentiated Products", Annales d'Économie et de Statistique No. 34, Économétrie de la concurrence imparfaite / Econometrics of Imperfect Competition, pp. 159-180. Elasticity estimation can also be obtained by means of the residual demand analysis: for the beer industry it was performed in Baker, J. B. and Bresnahan, T. F. (1988) "Estimating the residual demand curve facing a single firm", International Journal of Industrial Organization, Elsevier, vol. 6(3), pages 283-300.

[25] The UPP test is developed in Farrell, J., and C. Shapiro (2010) "Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition", The BE Journal of Theoretical Economics, 10(1), 9.

$$UPP_A = D_{AB} \left(p_B - mc_B \right) - E_A, \tag{7}$$

where p_B is the pre-merger price of the product produced by firm B, and $E_A = (mc_A - mc_A^m)$ is the difference between the pre- and post-merger marginal costs, i.e., the level of cost efficiency gains delivered by the firm A. The index, UPP_A, thus compares two forces: the value of diverted sales, that push the price up, and the cost efficiencies that offset this positive price effect. Whenever UPP_A is positive, firm A has an incentive to increase its price. For the price of product A to remain unchanged, or even to fall below the pre-merger level, the following condition should be satisfied:

$$E_A = mc_A - mc_A^m \geq MLE_A = D_{AB} \left(p_B - mc_B \right), \tag{8}$$

The right-hand side of Inequality (8) represents a threshold above which efficiencies delivered by firm A can be considered sufficient to offset any possible price increase due to the merger. Analogous calculations can be performed for the firm B.

This approach requires very limited data, and only that of the merging firms. Besides, it does not require knowledge of market shares, thereby avoiding the problem of market definition. However, the above MLE formula, as well as the UPP value in Equation (7), are derived under the assumption of constant marginal costs. If this assumption is inappropriate given the real business environment, the results can be brought into question.

MLE under total welfare standard

When the competition authority adopts a total welfare (surplus) standard, efficiencies are considered as sufficient when they allow the total welfare to remain at the pre-merger level, or to increase.[26]

There are several merger-related shifts in consumer and producer welfare that should be taken into account. On one hand, a possible post-merger increase in price would harm consumers by reducing their surplus, while it would simultaneously increase merging firms' profits (producer surplus). When this price change reduces consumer welfare by a larger amount than it increases producer surplus, a deadweight loss (DWL) arises. If, pre-merger, firms already enjoyed a certain market power (implying that a deadweight loss was present), then only the additional merger-related DWL (denoted henceforth ΔDWL) should be subtracted from the total welfare. On the other hand, if the merger brings about certain efficiencies, both in fixed and in variable costs, then it would also contribute to increasing profits, thus further enhancing producer surplus. Under a total welfare standard, transfers of the surplus between market agents (e.g., between producers and consumers) are considered neutral. Therefore the net effect of the merger is defined by the trade-off between delivered cost efficiencies and the deadweight loss brought about by the merger. The MLE is simply equal to ΔDWL.

Graph 1 illustrates the above logic on a simplified example. Firms sell a homogenous product that is produced at constant variable cost. Market demand is linear. The pre-merger state is characterized by the price P^*, the marginal cost MC^* and the quantity sold Q^*. Let P_m be the estimated post-merger price level, such that $(P_m > P^*)$,resulting in a decrease in sales from Q^* to Q_m. The merger delivers cost efficiencies, such that the per-unit costs drop from MC^* to MC_m.

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[26] In this report we employ the terms "welfare" and "surplus" interchangeably.

Pre-merger state, total welfare would be maximized if price were equal to marginal costs *MC**, and the quantity *Q*** was sold. However, in our example, we allow merging firms some market power, such that *P** > *MC**. This creates a deviation from the maximal welfare level, i.e., a deadweight loss (area C).
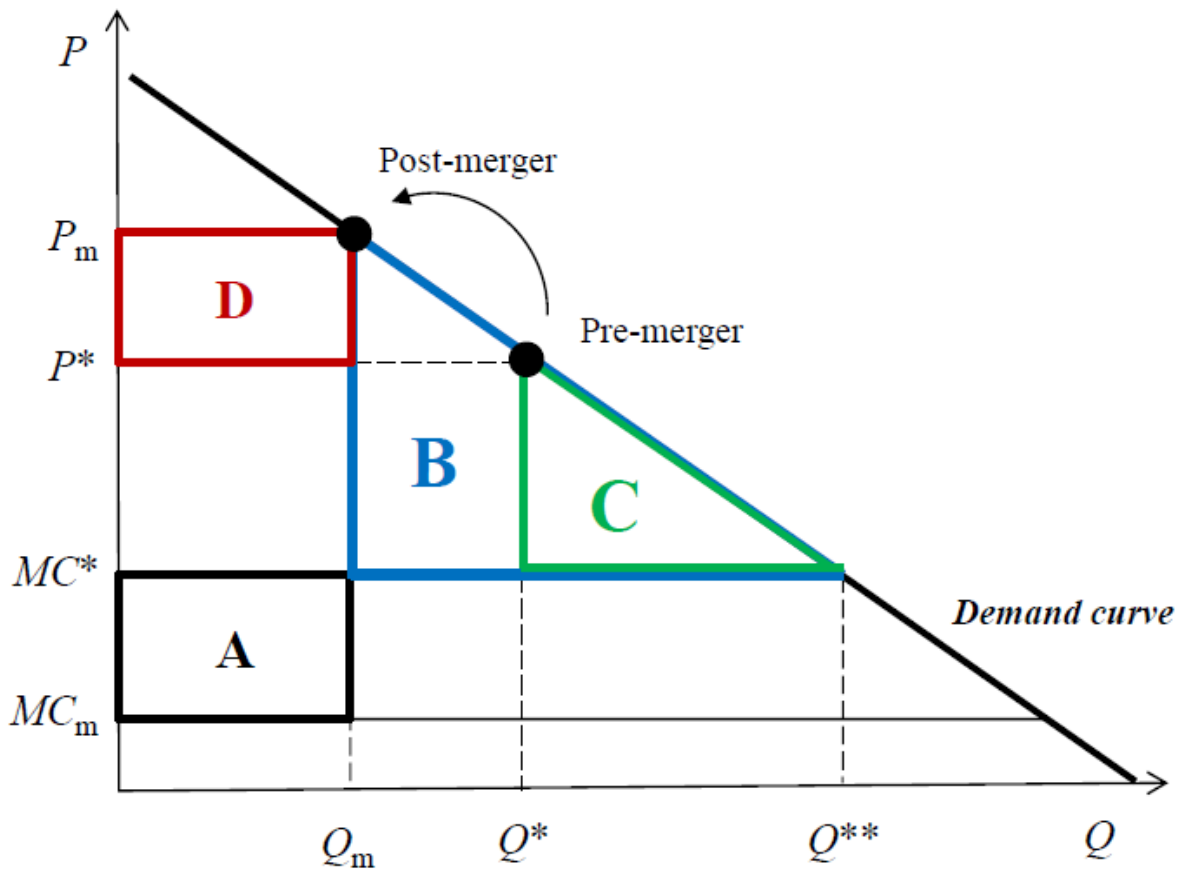
Graph 1: Comparison of pre- and post-merger equilibria

When firms are able to increase their market power post-merger, i.e., charge the price that is even higher (*P* > P*), this would increase the deadweight loss (area B). Area D, therefore, constitutes a welfare transfer from consumers to producers, and area B minus area C is a merger-specific deadweight loss. Cost efficiencies brought by the merger that increase

firms' profits (and thus producer surplus) make up area A. Thus, the cost efficiencies that would leave the total welfare unchanged post-merger can be calculated in the following way:

$$MLE = \Delta DWL = B - C. \tag{6}$$

Here the MLE is not expressed in per unit terms, but as a total sum that includes reductions in both variable and fixed costs. Savings in total variable costs should be calculated with respect to the post-merger production level.

If market demand is indeed linear and marginal or per-unit variable costs are constant, then the change in deadweight loss associated with merger, and therefore the MLE, can be calculated as follows:

$$MLE = \Delta DWL = \left(\frac{1}{2} \left(\frac{p^m - p}{p} \right)^2 + \left(\frac{p^m - p}{p} \right) \left(\frac{p^m - c}{p} \right) \right) \varepsilon p q, \tag{10}$$

where p and p^m are the prices defined at pre- and post-merger levels respectively, ε is the pre-merger price demand elasticity and q is the pre-merger quantity of the product sold.[27]

Caveats of the MLE approaches

The MLE approaches described above are practical because they require very limited data. They employ relatively simple formulae with a few key input variables. Of course, this simplicity comes at a cost.

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[27] The derivation of the formula can be found in Neher D., D. Russo and J.D. Zona (2005) "Lessons from the Superior/ICG Merger", The George Mason Law Review.

First, all the MLE approaches proposed above consider only cost efficiencies and do not account for other sources of efficiencies, which are discussed in Section 2. Nevertheless, if cost reductions alone would be found to be sufficient, the competition authority may decide that the substantiation of other claimed efficiencies is unnecessary.

Second, the only negative post-merger effect considered in these approaches is a price increase. A merger can cause other undesirable effects, such as lower quality or reduced variety. This limitation should be clearly understood, especially when non-pricing effects are expected to play an important role..

Third, as they are based on only a few ingredients, the MLEs are sensitive to variations in the input variables. To address this issue, the estimation of MLEs should not be based on a unique value for each variable, but rather on reasonable ranges.

Finally, all of the MLE formulae proposed above are based on strong assumptions, such as a particular competition mode (in prices or in quantities), constant elasticities or constant marginal costs. The credibility of the obtained results largely depends on whether these assumptions are supported by the real market data. If conformity with the assumptions cannot be verified, then it would be reasonable to test different approaches to see whether estimates converge to the same value, and if not, to take the maximum of the obtained MLE estimates. Given that the proposed formulae often contain the same ingredients, one may use multiple approaches at almost no cost.

When a more flexible tool is needed, for instance, one that could take into account different types of merger-related efficiencies that can potentially effect both prices and welfare, a merger simulation might be more appropriate. Such an approach would require a deeper knowledge of the relevant market, a more comprehensive dataset containing information on both merging and non-merging firms, and substantial expertise in both modeling and, possibly, empirical methods.

Merger simulation

To date, the merger simulation is the most flexible tool that a competition authority can use to assess post-merger effects, both pro- and anti-competitive. This tool allows for direct incorporation of a broader range of efficiencies into the merger analysis, which makes it especially appropriate for evaluating the net impact of the merger. When convenient, it can be also employed to estimate the MLE.

A standard merger simulation involves three steps: i) the design of a demand and supply model based on a market analysis; ii) the calibration or estimation of the parameters of the chosen model based on pre-merger market data; iii) the simulation of the merger under investigation, i.e., the evaluation of the impact of the proposed merger on prices, quantities and other parameters of interest, taking into account possible cost efficiencies and remedies. This report is not aimed at providing a detailed explanation of how each step is performed, but rather at giving a general idea of the method and its application to efficiency analysis.[28]

The design of the market model includes the specification of demand and supply functions, as well as a rule or mechanism according to which they interact with each other. The demand side is usually represented by a function that explains the dependence between the quantities of the relevant product(s) or service(s) demanded and certain parameters that characterize consumer choices, e.g., prices, quality level, etc. Certain demand functions allow the explicit calculation of consumer welfare (surplus), making them particularly attractive for measuring the impact of mergers.[29]

Designing the supply side requires defining the competing firms, the products or services that they offer and the corresponding cost functions, as well as the interaction mode that the

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[28] Werden G. J. (1997) "Product Differentiation: Simulating the Effects of Differentiated Products Mergers: a Practical Alternative to Structural Merger Policy", George Mason Law Review, Vol.5, 363, provides a detailed description on how to perform model simulations. Some other explanations and examples can be found in Werden G.J. and L.M. Froeb (1994) "The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy", Journal of Law, Economics, and Organization, 10(2), pp. 407-26.

[29] For instance, discrete choice demand systems possess this property. For details see Anderson S. P., A. De Palma and J.-F. Thisse (1992) "Discrete Choice Theory of Product Differentiation", Journal of Economics, Vol. 59, No. 2 (1994), pp. 252-255

firms follow while competing with each other. Standard modes of competition employed in merger simulations include Bertrand or Cournot competition. In brief, the Bertrand oligopoly model describes a market with a relatively small number of firms that compete on price, while the Cournot model assumes that firms compete on quantity, i.e., they choose their output level before they set their prices. There exist numerous extensions and variations of these basic modes of competition that incorporate, for instance, the possibility of dynamics.[30]

It is important to verify whether the assumptions under which the market model is constructed are realistic. To do so, good knowledge of the industry is essential. One must also check whether the model specification provides the possibility of integrating claimed cost efficiencies, for instance, by giving explicit functional forms to the demand and cost functions. If the demand function incorporates product quality characteristics, it becomes possible to estimate the effect of post-merger quality improvements or product repositioning.[31] Some work has been done to develop approaches that gauge the impact that the introduction of new products may have on consumer welfare.[32] Supply-side efficiencies, such as reductions in per-unit and marginal costs related to rationalization of production, distribution operations and servicing, fixed costs reductions, and economies of scope and scale in production, can be modeled by means of the cost function form. [33]

Once the market model design is complete, parameters used to build the chosen functions should be set to values that are compatible with actual market data, such as prices

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[30] A quite extensive report on merger simulations with examples of demand systems and more detailed explanations concerning competition modes can be found in Budzinski O. and I. Ruhmer (2008) "Merger Simulation in Competition Policy: A Survey", available at SSRN: http://ssrn.com/abstract=1138682.

[31] The possibility of incorporating product repositioning, divestitures and cost savings in merger simulations are illustrated in the article of Epstein R. J. and D. L. Rubinfeld (2001): "Merger Simulation: a Simplified Approach With New Applications", available at SSRN: http://ssrn.com/abstract=291222 or http://www.royepstein.com/alj_final_proof_sup.pdf.

[32] See, for instance, an article of Petrin A. (2002) "Quantifying The Benefits Of New Products: The Case Of The Minivan", Journal of Political Economy, Vol. 110, pp. 705-729 or a book "The Economics of New Goods" (Chicago: 1997) edited by T. Bresnahan and R. Gordon.

[33] An example of the cost function that allows for scale and scope economies can be found, for instance, in" by Fraquelli G., M. Piacenza and D. Vannoni (2002) "Scope and scale economies in multi-utilities: evidence from gas, water and electricity combinations", working paper.

and market shares. The values of these parameters may already be known to the merging parties; otherwise they can be collected from existing market studies, estimated via an econometric method or assumed. The typical outcome of this step is as a set of equations that describe the pre-merger functioning of the market.

On the basis of these equations, the merger under investigation is then simulated to estimate its impact on prices, or on other variables of interest such as welfare.

Efficiencies can be introduced into the analysis in two ways. The first way is an exogenous or 'manual' correction of the demand or supply parameters that would implicitly reflect, for instance, quality improvements or cost reductions. Otherwise, certain efficiencies may come into effect 'automatically'. This is the case, for example, for scale and scope economies when the appropriate cost functions are used, as costs adapt automatically according to the level of production. Efficiencies such as the removal of double marginalization or pricing downward effects in conglomerate mergers could also be integrated in the analysis, as they result from a post-merger change in firms' strategic behavior.

Merger simulation is a very convenient tool for estimating the net effect of the merger, providing a coherent framework which accounts for both anti-competitive forces in terms of reduced competition between merging firms, and pro-competitive ones in terms of efficiencies. Note that merger simulation can also be considered an MLE approach, as the model can be used to compute the MLE as well. However, compared to the simple formulae presented earlier, an MLE computed from the merger simulation model would take a richer and more realistic structure into account.

Performing a merger simulation can significantly improve the accuracy of the estimates of the impact that a merger could have on prices and other key variables, and may therefore help achieve a higher standard of proof. On the other hand, this procedure usually requires a significant dataset, which may be a serious constraint for the competition authority and merging firms. Moreover, it requires extensive expertise to properly build the market model

and interpret the simulation results, particularly as these results are often sensitive to underlying assumptions.[34] Models rely on simplification by their very nature, but even simple modifications can provide useful insights concerning the likely effects of the merger. Higher flexibility is often associated with a greater complexity; it is therefore important to strike the right balance between the two. Doing so allows all the important ingredients of the analysis to be taken into account, while insuring that the involved parties, including the personnel of the courts, are able to understand and interpret the results of the merger simulation.

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[34] The effect of the chosen demand system on the results of merger simulation are discussed in Crooke, P., Froeb, L.M., Tschantz, S. and Werden, G.J. (1997) "Effects of the Assumed Demand System on Simulated Postmerger Equilibrium", U.S. Department of Justice - Antitrust Division, Papers 97-3.

Appendix: Case references

Case	Relevant efficiency category(/ies)	Merger-specificity/ Verifiability/ Offsetting effect	Sufficiency	Source
Avant! /Synopsys, Inc (Federal Trade Commission (FTC), U.S., 2002) - **APPROVED**	Double marginalization, new and improved products, complementary assets.	Established.	Established.	http://www.ftc.gov/os/caselist/0210049.shtm
Asda Stores Limited/Netto Foodstores Limited (Office of Fair Trading (OFT), UK, 2010) - **APPROVED**	Economies of scale and rationalization in procurement, storage and distribution; repositioning.	Established.	Established.	http://www.oft.gov.uk/OFTwork/mergers/decisions/2010/Asda
BHP Billiton PLC&BHP Billiton Limited /Rio Tinto PLC/ Rio Tinto Limited (Japan Fair Trade Commission (JFTC), Japan, 2010) - **SUSPENDED**	Fixed costs savings, rationalization, technology transfer, quality improvement.	Merger specificity, verifiability and offsetting effect were not established.	Not established.	http://www.jftc.go.jp/en/policy_enforcement/mergers/index.files/MajorBusinessCombinationCasesFY2010.pdf Page 14.

Dräger Medical AG & Co KGaA /Air-Shields (Competition Commission (CC), EU, 2004) - case referred from the OFT, UK - APPROVED	Scale economies (production and R&D), distributional rationalization, and improved innovation.	Efficiencies are not quantified, offsetting effect is not established.	Not established. Case approved with remedies.	http://www.competition-commission.org.uk/our-work/directory-of-all-inquiries/drager-medical-ag-co-kgaa-air-shields
Directories/GoudenGids (NMa[35], Netherlands, 2008) - APPROVED	Network effects, new product.	Established partly.	Not established as efficiency defense was found unnecessary.	http://www.competitioneconomics.org/dyn/files/basic_items/329-file/Ron%20KempACE%202010-11-11.pdf
DirecTV/ Dish Network (Department of Justice (DoJ, U.S. 2002) - SUSPENDED	Quality improvement, complementary assets, rationalization (cost reduction).	Established.	Not established.	For a brief description see the U.S. Commentary on the Horizontal Merger Guidelines, p. 55, at http://www.justice.gov/atr/public/guidelines/215247.htm
Gai's/United States Bakery (DoJ, U.S., 1996)	Interrelated markets.	Established.	Established.	For a brief description see the U.S. Commentary on the Horizontal Merger Guidelines, p. 57, at

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[35] At present, it is the Netherlands Authority for Consumers and Markets that combines the Netherlands Competition Authority (NMa), the Netherlands Consumer Authority, and the Independent Post and Telecommunications Authority of the Netherlands (OPTA).

- APPROVED				http://www.justice.gov/atr/public/guidelines/215247.htm
Gencor&Lonrho /Impala Platinum Holdings Ltd (CC, EU, 1996) **- SUSPENDED**	Technology sharing, fixed costs savings, scale economies.	Offsetting effect of efficiencies is not established.	Not established.	http://ec.europa.eu/competition/mergers/cases/decisions/m619_en.pdf Section VIII, page 43.
Genzyme/Ilex (FTC, U.S., 2004) **- APPROVED**	Interrelated markets, optimization of R&D activities.	Verifiability is established partly.	Not established. Case approved with remedies.	http://www.ftc.gov/opa/2004/12/genzyme.htm
Genzyme/Novazyme (FTC, U.S., 2001) **- APPROVED**	Complementarity of assets and R&D programs, new or improved products, dynamic efficiencies.	Established.	Established.	http://www.ftc.gov/opa/2004/01/genzyme.shtm
Google Inc. / BeatThatQuote.com Ltd (OFT, UK, 2011) **- APPROVED**	Network effect, complementary assets, new and improved services.	Established.	Not established as efficiency defense was found unnecessary.	http://www.oft.gov.uk/shared_oft/mergers_ea02/2011/Google-BeatThatQuote.pdf
Global Radio UK/ GCap Media	Complementary assets, repositioning, pricing	Established.	Established.	http://www.oft.gov.uk/shared_oft/m

(OFT, UK, 2008) - **APPROVED**	effects (bundling, complementary products), reduction of transactional costs (one stop shopping).			ergers_ea02/2008/Global_GCap.pdf
Heinz/Beech-Nut (FTC, U.S., 2000) - **SUSPENDED**	Improved products, rationalization, economies of scale and scope in production and distribution, fixed costs savings.	Merger specificity and verifiability are not established.	Not established.	"Efficiencies and High Concentration: Heinz Proposes to Acquire Beech-Nut (2001)" by J.B. Baker, available at http://www.oup.com/us/pdf/kwoka/ 9780195322972_06.pdf
IMC Global/Western Ag (DoJ, U.S., 1997) - **APPROVED**	Sufficiency, rationalization (logistics), complementary assets.	Established.	Established.	For a brief description see the U.S. Commentary on the Horizontal Merger Guidelines, p. 58, at http://www.justice.gov/atr/public/gui delines/215247.htm
Nucor/Birmingham Steel (DoJ, U.S., 2002) - **APPROVED**	Rationalization of delivery and supply, fixed costs savings.	Established.	Established.	For a brief description see the U.S. Commentary on the Horizontal Merger Guidelines, p. 50, at http://www.justice.gov/atr/public/gui delines/215247.htm
PayPal/eBay (DoJ, U.S., 2002) - **APPROVED**	Network effects, complementary assets.	Established.	Established.	For a brief description see the U.S. Commentary on the Horizontal Merger Guidelines, p. 55, at http://www.justice.gov/atr/public/gui delines/215247.htm

Procter&Gamble/Gillette (CC, EU, 2005) **- APPROVED**	One stop shopping, pricing effect (bundling, complementary products), economies of scale and scope for retailers and suppliers.	Established.	Not established. Case approved with remedies.	http://ec.europa.eu/competition/mergers/cases/decisions/m3732_20050715_20212_en.pdf
Superior Propane Inc./ICG Propane Inc. (Competition Bureau, Canada, 2003) **- APPROVED**	Total welfare standard, fixed costs savings, rationalization.	Established.	Established.	http://reports.fja-cmf.gc.ca/eng/2003/2003fca53.html "The Efficiencies Defence Saves the Superior Propane/ICG Merger (for now)" by A. F. Baldanza, D.O'Connor and S. P. Kutty, available at http://www.fasken.com/files/Publication/db2bc1ff-f721-4759-92bc-7099364ee28a/Presentation/PublicationAttachment/9368bf79-08ce-4f03-892b-30d1f87ac6f5/The_Efficiencies_Defence.pdf
Verizon/ MCI and SBC/AT&T (DoJ, U.S., 2005) **- APPROVED**	Complementary assets, pricing effects (complementary products).	Established.	Established.	Verizon/ MCI: http://www.usdoj.gov/atr/cases/verizon.htm SBC/AT&T: http://www.usdoj.gov/atr/cases/sbc2

				.htm
Whirlpool/Maytag, (DoJ, U.S., 2006) **- APPROVED**	Rationalization (procurement, manufacturing, logistics).	Established.	Established.	http://www.justice.gov/opa/pr/2006/March/06_at_187.html http://investors.whirlpoolcorp.com/releasedetail.cfm?ReleaseID=532012
XM Satellite Radio/Sirius Satellite Radio (DoJ, U.S., 2008) **- APPROVED**	Economies of scale, fixed costs savings.	Established.	Established.	http://www.justice.gov/opa/pr/2008/March/08_at_226.html