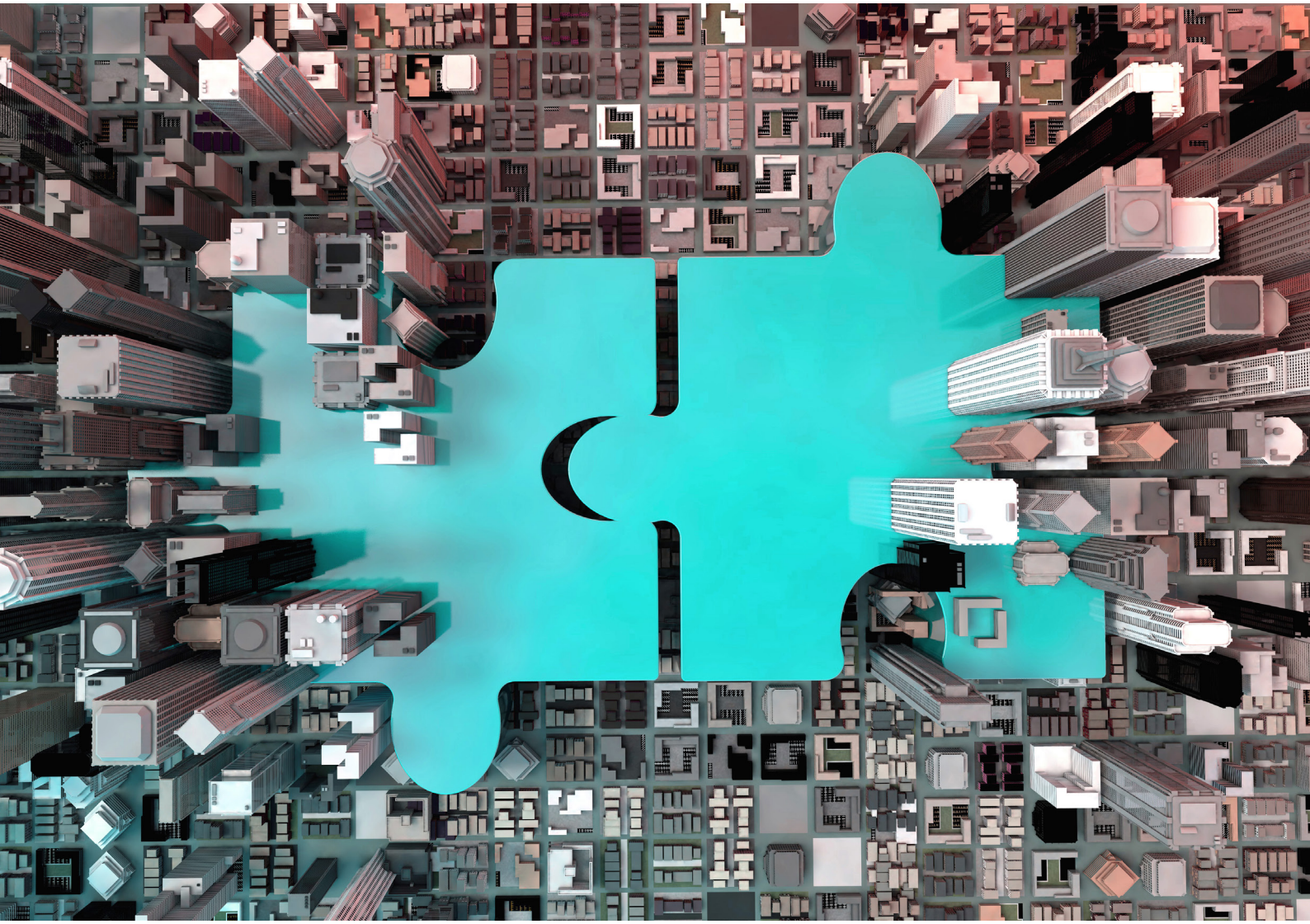
Merger Control in Dynamic Markets



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Foreword

The competition dynamics observed in rapidly-evolving sectors, such as high-technology, consumer services and online retail, is challenging the role of competition authorities in merger control, where enforcement decisions depend on an effects-based analysis of the likely future effects of the merger. As these sectors are typically characterised by high entry and exit rates, as well as innovation that continuously disrupts existing business models, it is increasingly harder for authorities to predict how markets will evolve in order to support merger decisions. This is made worse by the fact that many of the merger tools currently available tend to focus on the recent-past or current state of the market, instead of forwardly looking at how the market might evolve post-merger. This paper discusses the role of merger control in dynamic markets and identifies the main practical proposals that have been made to adapt the different stages of the review process to take into account market dynamics over time: (1) the competitive assessment of the merger, (2) the analysis of efficiency effects and (3) the design of remedies.

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Chapter 1. Introduction

The competitive dynamics observed in rapidly-evolving sectors, such as high-technology, consumer services and online retail, have been increasingly challenging the work of competition authorities all around the world. Unlike traditional industries that suffer little changes over time (e.g. extraction of natural resources or production of raw materials), dynamic sectors are characterised by higher entry and exit rates, as well as continuous processes of innovation that systematically disrupt existing business models and create entirely new markets. In such a dynamic environment, it is very difficult to make effects-based predictions to support enforcement decisions, especially when such actions require a case-by-case analysis of the facts at hand.

One of the enforcement areas that has been greatly challenged by modern competitive dynamics is merger control, as it is not always clear how a merger might affect the performance of markets that are subject to constant change and disruption. This is aggravated by the fact that merger assessment tools, which are meant to assess the *future* effects of the merger, tend to focus on the *current* structure of markets, instead of forwardly looking at how markets might evolve post-merger. Examples of this static focus of merger control include an over reliance on static measures of concentration, a general lack of consideration of merger effects on innovation, and a possible overuse of remedies that do not adapt to changes in market conditions over time.

In light of the limitations of traditional merger assessment tools, there are some proposals to extend the timeframe of merger control beyond the analysis of immediate static effects. On the one hand, the assessment of the dynamic effects of mergers could potentially increase the economic relevance of merger control, by enabling authorities to preserve long-term competition and innovation, which are more likely to sustainably boost consumer well-being than static price competition. On the other hand, assessing dynamic effects within a long timeframe could trade-off an increase in legal uncertainty and result in more enforcement errors, as it is inherently hard to predict how markets will evolve post-merger.

This note discusses how to adapt merger control to dynamic markets within three stages of the review process: the assessment of competitive effects, the analysis of efficiencies and the design of remedies. In particular, it focuses on practical proposals to assess the dynamic effects of mergers based on economic evidence generally available to authorities, while attempting to reduce the risk of enforcement unpredictability. This note builds on previous OECD work about dynamic considerations in merger control, including non-price effects of mergers (OECD, 2018[1]), dynamic efficiencies in merger analysis (OECD, 2007[2]), remedies in merger cases (OECD, 2011[3]) and vertical mergers in the technology, media and telecom sector (OECD, 2019[4]).

The research conducted in the context of this paper leads to the following preliminary findings:

1. **The long-term impact of mergers on consumer welfare is ambiguous and must be assessed on a case-by-case basis.** Mergers may lessen competition on both static and dynamic dimensions, but they may also produce short and long-term efficiency effects. The risk of net consumer harm is greater for horizontal mergers that combine close substitutes with substantial entry barriers, while vertical and conglomerate mergers rarely pose competitive concerns.
2. **The assessment of dynamic effects can help improving the precision of merger control.** As mergers sometimes have conflicting static and dynamic effects (e.g. a merger may reduce price competition but promote innovation), a purely static analysis can result in enforcement errors. In those cases, the assessment of the effects of the merger within a longer timeframe might reduce the risk of under enforcement and over enforcement.
3. **Merger assessment tools are flexible and can be adapted to assess competitive effects within a longer timeframe**. Some practical measures to assess dynamic effects include (1) analysing whether the merging firms own substitute innovation resources, (2) looking at the evolution of market shares over time, (3) evaluating barriers to entry and exit in a market, and (4) adapting standard pricing pressure tests to quantify competitive effects on innovation.
4. **Dynamic efficiency claims deserve special consideration, as they are more likely to bring benefits to consumers than static efficiencies.** Mergers enable firms to benefit from economies of scale and to appropriate spillovers from innovation activity, thereby increasing their incentives to invest in R&D. Mergers also facilitate the profitable exit of successful entrepreneurs and inefficient firms, potentially encouraging the entry of new innovative firms.
5. **Structural remedies may address dynamic anti-competitive effects of horizontal mergers without compromising dynamic efficiencies.** By requiring the merging firms to divest overlapping innovation resources without close substitutes, structural remedies are sometimes less restrictive than a full prohibition decision. Whenever the dynamic effects of the merger are uncertain, authorities might consider designing flexible remedies whose execution is conditional on the realisation of future market events.

The remainder of the paper is structured as follows. Chapter 2. discusses the dynamic effects of mergers taking into consideration the findings from the theoretical and empirical literature. Chapter 3. describes the competitive assessment of mergers in a dynamic environment, debating how traditional tools can be adapted in order to extend the timeframe of the analysis. Chapter 4. addresses dynamic efficiency effects that may generate substantial gains over time despite not producing immediate gains in the short-term. Chapter 5. is devoted to the design of remedies to address static and dynamic concerns, discussing how they can be adapted in light of market changes. Finally, Chapter 6. concludes.

Chapter 2. Dynamic effects of mergers: theory and evidence

Economic theory and empirical evidence play an important role in guiding merger policy (OECD, 2011[5]). It has been recognised for long that mergers can either have a positive or a negative impact on competition, depending on their nature and on the specific circumstances of the market. For that reason, competition authorities in most jurisdictions do not treat mergers as illegal by object, but assess instead their effects on a case-by-case basis, applying what is known as an effects-based approach or a rule of reason (Werden, 2014[6]). The findings of the academic literature and ex-post studies can assist authorities distinguishing mergers that are potentially problematic, making enforcement decisions and, when necessary, designing appropriate remedies.

Although the economic literature has traditionally focused the analysis of mergers on static effects (Farrel and Shapiro, 1990[7]) (McAfee and Williams, 1992[8]), a growing body of literature has more recently looked at dynamic or longer-term effects (OECD, 2018[1]) (Hassen et al., 2018[9]). Some studies suggest that mergers that initially seem problematic pose few competitive concerns when one looks beyond their immediate impact (Benkard, Bodoh-Creed and lazarev, 2019[10]). Other studies find the opposite, that is, the anti-competitive risks of some mergers are exacerbated when one considers a longer timeframe of analysis (Chen, 2009[11]). Either way, evaluating the dynamic effects of mergers could improve the precision of merger enforcement, reducing the risk of false positives (over enforcement) and false negatives (under enforcement).

One of the criticisms often made by recent economic literature is that traditional merger enforcement tends to over rely on the traditional structure-conduct-performance (SCP) framework (Sidak and Teece, 2009[12]). The SCP framework is an analytical tool to assess the relationship between market structure, firms' conduct and performance of the industry, usually applied in the context of competition policy (Bianchi, 2013[13]) (Mason, 1939[14]) (Bain, 1959[15]). While useful to understand the essential mechanisms through which a merger can affect market outcomes, a blind application of this framework may dismiss important dynamic effects, by assuming a unidirectional static effect of market structure on conduct, and of conduct on performance.

This section identifies the main dynamic effects of mergers on market structure, business conduct and market performance over a long timeframe, taking into consideration the findings from the theoretical and empirical literature. In order to do so, it looks beyond the traditional static version of the SCP framework and considers dynamic reverse effects of market performance on firms' conduct, and of conduct on market structure (McKinsey, 2008[16]). It is thus the purpose of this section to provide some background information to support the more practical case-specific analysis of mergers discussed in the remaining sections of this note.

2.1. Effect on *market structure*

Market structure is the set of relevant market characteristics that affect firms' competitive behaviour and, ultimately, the efficient performance of a market. Among other factors, the structure of a market can be characterised by the level of barriers to entry and exit, concentration, vertical integration, diversification, protection of property rights, asymmetry of information and overall economic freedom (that is, the freedom to set prices, advertise products, choose suppliers, determine the characteristics of a product, etc.). All these aspects of market structure depend not only on exogenous factors such as technological restraints, but also on the regulatory framework, public policy and action of firms (for instance, through the patenting of new ideas, monopolisation of natural resources and lobbying of governments).

Mergers may affect market structure in several ways, depending on their nature (Trembley and Trembley, 2012[17]). A horizontal merger (between direct competitors) can influence the level of concentration of a market, a vertical merger (between a supplier and a customer) may increase the level of vertical integration and a conglomerate merger (between complementary or unrelated businesses) can affect the level of diversification. In practice, most mergers have a mixed nature and hence affect multiple dimensions of the market structure at the same time. In addition, regardless of their nature, mergers may also reduce barriers to exit, by enabling firms to sell their assets and recover fixed costs that would have been sunk if merging was not a viable exit strategy (OECD, 2019[18]).

The impact of a merger on market structure in the medium to long term depends on the existence of significant barriers to entry and exit. In the limit situation where both entry and exit are entirely free, the structure of a market is solely determined by the production technology and the features of demand (Baumol and Willig, 1986[19]). In particular, market concentration is determined by the relative size of economies of scale, whereas vertical integration and diversification depend on the size of economies of scope. Mergers in markets without entry and exit barriers are thus unlikely to have any important structural effects, because firms can exhaust all profitable entry opportunities and use alternative exit strategies until the market structure converges to its natural equilibrium.

As barriers to entry and exit exist to some extent in most markets, the structural impact of a merger generally depends on the dimension of those barriers. If on the one hand entry and exit barriers are relatively low, a merger that enhances market power and increases profits could soon attract new entrants who reverse the initial structural effect of the merger, despite the fact that entry would be unprofitable pre-merger (Siebert, 2016[20]). In other words, by affecting market *performance*, mergers can encourage new entry (*conduct*) and revert the market to its original *structure*. On the other hand, where barriers to entry and exit are high, a merger can enhance market power or create inefficiency without affecting the prospects of new entry or exit, therefore leading to a more permanent impact on market structure (Müller, 1976[21]).

Empirical evidence suggests that, in practice, mergers often trigger new entry, potentially limiting their structural effects to the short-term in several cases.[1] A study examining over 10 thousand mergers in the US commercial banking industry, where entry barriers arguably exist, concluded that "*M&As are associated with statistically and economically significant increases in the probability of entry*" (Berger et al., 2004[22]). A more recent study focusing on a semiconductor market found that "*mergers dominated by market power effects result in a higher number of firms than efficiency dominated mergers*" (Siebert, 2016[20]).[2] A series of ex-post studies of in-depth merger investigations in the EU show that post-merger

entry occurred in 80% of the cases where the merger was unconditionally cleared (European Commission, 2015[23]). All this evidence highlights the importance of assessing entry barriers within a merger assessment.

2.2. Effect on *business conduct*

Business conduct consists of the strategic behaviour of firms across a variety of competitive dimensions, some of them static – having an immediate short-term effect – and others dynamic – with more long-lasting effects. Static dimensions of competition include not only the pricing strategy, but also others decisions about production, marketing and distribution that affect quality attributes of the product, such as the design, safety, durability, availability, content and level of customisation, among others. Dynamic dimensions of competition fundamentally include the introduction of product and process innovations, capital investment, R&D, as well as decisions to entry or exit a market.

The effect of a merger on business conduct also depends on the relative dimension of barriers to entry and exit in the market. When entry and exit are both free, mergers are not likely to enhance market power or to affect the equilibrium strategy of the merging firms, whose conduct is constrained by the constant threat of potential competitors (Davidson and Mukherjee, 2007[24]). In the theoretical case of a perfectly contestable market, where by definition entry and exit are absolutely free (OECD, 1993[25]), firms' conduct is optimal in the sense that maximises consumer and total welfare, regardless of the level of concentration observed:

> *"[A] 'perfectly contestable market' (...) is, generally, characterized by optimal behavior and yet applies to the full range of industry structures including even monopoly and oligopoly. In saying this, it must be made clear that perfectly contestable markets do not populate the world of reality any more than perfectly competitive markets do, though there are a number of industries which undoubtedly approximate contestability even if they are far from perfectly competitive. (Baumol, 1982[26])*

In contrast, in markets where barriers to entry and exit are significant, mergers reduce the incentive of firms to compete on prices, quality, investment and R&D, at least until new entry occurs. This risk is usually associated with horizontal mergers between close substitutes, which can create harmful unilateral effects by reducing the incentive of firms to compete for a greater share of the market (Ivaldi et al., 2003[27]). Horizontal mergers can also increase the risk of co-ordinated effects by reducing the number of competitors, especially if firms become more symmetric after the merger (Ivaldi et al., 2003[28]). In rarer occasions, vertical and conglomerate mergers could lessen competition by enabling the merging parties to foreclose competitors or to facilitate tacit-coordination (OECD, 2019[4]).

Mergers may also generate efficiencies that could offset, at least partially, their anti-competitive effects. Horizontal mergers are often claimed to achieve economies of scale, while vertical and conglomerate mergers may lead to economies of scope (Given, 1996[29]). Mergers can also create horizontal externalities or spillovers, by allowing firms to better appropriate the gains from innovation (Spence, 1984[30]), as well as vertical externalities, for instance by eliminating double marginalisation (Spengler, 1950[31]) and hold-up problems (Hart and Moore, 1990[32]). Moreover, mergers can improve dynamic efficiency by serving as an alternative exit strategy (Sokol, 2018[33]), facilitating the elimination of inefficient firms and the fast expansion of successful innovators. In turn, market exit creates space for new entrants, who may either succeed, or fail and give space to a new competitor, perpetuating in this way the evolutionary process.

When efficiency effects are at stake, mergers might have a heterogeneous impact on static and dynamic dimensions of conduct (Grajek et al., 2019[34]). For instance, a merger that temporarily raises market power is likely to harm price competition, but could also encourage investment and innovation by enabling the merging firms to better internalise horizontal spillovers. Alternatively, a merger may enable firms to achieve economies of scale and reduce prices in the short-run, but lessen their incentive to compete in the development of innovative products in the long term. The existence of a trade-off between static and dynamic competition makes the effects-based analysis of merger control inherently more complex.

2.3. Effect on *market performance*

Market performance refers to how well a market achieves a certain public policy objective, such as an efficient and equitable outcome. Within competition policy, market performance is usually understood in a consumer welfare sense, that is, a market performs well if it provides good outcomes for consumers. In jurisdictions with a total welfare standard, performance refers instead to how well a market promotes efficiency in terms of resource allocation, production scale and cost technology. Depending on the particular welfare standard, static measures of performance include average prices, quality-adjusted prices and value added, while dynamic measures include indicators of innovation activity (e.g. R&D expenses, number of patents) and productivity growth.

Most mergers do not raise competitive concerns and are thus unlikely to reduce market performance, at least in the long-term. Some empirical studies find that mergers have a positive long-run impact on performance by creating efficiencies or synergies (Alhenawi and Krishnaswami, 2015[35]), even though such effects can take several years to materialise (Maksimovic, Phillips and Prabhala, 2011[36]) (Fulghieri and Sevilir, 2011[37]). This pro-competitive view of mergers does not imply, however, that mergers necessarily benefit both merging firms, as some studies find that acquirers tend to underperform their targets and other non-acquirers (André, Kooli and L'Her, 2004[38]) (Malmendier, Moretti and Peters, 2018[39]).

A possible explanation to why mergers create long-term benefits is the fact that they make market exit more profitable, therefore promoting both exit and new entry (Sokol, 2018[33]) (Henkel, Rønde and Wagner, 2015[40]) (Jaunaux, Lefouili and Sand-Zantman, 2017[41]). In turn, empirical evidence shows that higher entry and exits rates have a significant and important effect on productivity growth (Disney, Haskel and Heden, 2003[42]) (Scarpetta et al., 2002[43]) (Bosma and Nieuwenhuijsen, 2002[44]) (Segarra and Callejón, 1999[45]). In a study involving nine EU countries, the Commission concluded that "*it is desirable to pursue economic policies that improve entry and exit since the variation of the latter will generate significant and generally positive changes on macroeconomic performance*" (European Commission, 2005[46]).

There is, however, strong evidence that horizontal mergers worsen static market performance in some occasions. Recent surveys of retrospective merger studies found that most horizontal mergers reviewed by competition authorities, including those that were unconditionally cleared, resulted in short-term price increases and other negative non-price outcomes (Kwoka, 2014[47]) (Mariuzzo, Ormosi and Havell, 2016[48]) (Weinberg, 2007[49]). It should be noted, nonetheless, that most of the surveyed studies ignored price dynamics post-merger (Mariuzzo and Ormosi, 2017[50]). The only two studies that analysed a longer timeframe concluded that prices reverted to pre-merger levels after a short time period (Winston, Maheshri and Dennis, 2011[51]) (Focarelli and Panetta, 2003[52]).

In contrast, there is little empirical evidence that vertical and conglomerate mergers harm market performance, even in the short run. The main surveys of the literature conclude that vertical mergers generally lead to price falls and other positive welfare effects, despite the fact that these studies tend to focus on mergers scrutinised by authorities that were initially suspected problematic (Wong-Ervin, 2019[53]) (Global Antitrust Institute, 2018[54]) (Lafontaine and Slade, 2007[55]). These results are consistent with the notion that vertical mergers can only harm competition indirectly and create more substantial efficiency effects than horizontal mergers (OECD, 2019[4]). Conglomerate mergers tend to pose even less competitive concerns, though few empirical studies look at their effects.

Overall, the empirical evidence available seems to suggest a possible under enforcement against horizontal mergers and a risk of over enforcement against non-horizontal mergers. Yet this evidence should be interpreted with caution, because almost all studies tend to focus on static measures of performance during a short period after the transaction. Accordingly, the short-term harmful effect of many horizontal mergers might have been in many cases neutralised by new entry or offset by dynamic efficiencies. For the purpose of guiding future merger policy, it would be useful to have new ex-post studies assessing the impact of mergers on dynamic measures of performance, such as innovation and productivity growth, over a sufficiently long time period.

Notes

[1] Despite the fact that mergers often attract new entrants, in some occasions competition authorities may overestimate the probability of entry (KPMG, 2017[130]), potentially inhibiting them from intervening in mergers that could result in competitive harm.

[2] Mergers dominated by market power effects tend to attract new entrants, because they make entry more profitable. In opposition, mergers dominated by efficiency effects do not necessarily increase profits (namely if efficiency gains are passed through to consumers) and may therefore not lead to new entry.

Chapter 3. Dynamic assessment of competitive effects

The assessment of competitive effects is the most important stage of the merger review process and may yield significantly different conclusions depending on the timeframe of analysis. While competition authorities have traditionally focused their assessment on static price effects, it is increasingly recognised that merger enforcement should also account for dynamic effects on innovation, investment and future prices, which can be equally or even more important for consumers in the long term (Katz and Shelanski, 2005[56]) (Sidak and Teece, 2009[12]). The assessment of dynamic effects can thus help improving the precision of merger enforcement and protecting the long-term interests of consumers, though it may also raise legal uncertainty if the analysis of future effects is speculative and not supported by sound economic evidence.

This section discusses how competition authorities can adapt traditional merger tools in practice to assess the competitive effects of *horizontal mergers* over a longer time period, while keeping the review process sufficiently predictable and evidence-based. It identifies, in particular, practical measures that authorities may implement during four stages of the assessment: the identification of substitutes, analysis of concentration, assessment of barriers to entry and exit, and the quantification of effects.

Box 1. Notification thresholds

For merger review to be effective, jurisdictions must have *a priori* notification regimes capable of screening mergers that are likely to have harmful dynamic effects. In most jurisdictions with a merger control regime, companies are required to notify competition authorities of mergers that exceed a threshold based on certain economic criteria, such as the volume of turnover (sales), assets or market shares (OECD, 2016[57]). The main objective of the so-called merger notification thresholds is to exclude from review mergers that are not likely to have a material impact on a jurisdiction, enabling this way authorities to allocate their resources more efficiently to the analysis of other relevant cases. In some countries, authorities can still choose to review a merger even it does meet the notification thresholds.

Notification thresholds have often as main criteria the turnover of the merging parties, which is an objective and useful measure to identify mergers that may significantly affect competition, at least in a short timeframe. Indeed, since firms with substantial market power have typically a large dimension (although not all large companies have market power), a screen based on turnover is likely to produce few false negatives, capturing most mergers that can have an immediate negative impact on competition. However, a notification threshold solely based on turnover does not consider the possibility that a relatively small company with great growth prospects may soon become a viable competitor, thus failing to identify a merger that may reduce competition in the near future.

Notification thresholds based on transaction value, while less frequently used, can help identifying mergers that might lessen competition in the future, even if they do not necessarily pose competitive concerns at present (Streel and Larouche, 2015[58]) (Monopolkommission, 2015[59]). This is because a high value of transaction may reflect the acquisition of a highly innovative firm that is growing fast and likely to soon become a competitive threat, even if its turnover volume is currently small. An example of an important merger that did not meet traditional notification thresholds was the acquisition by Facebook of WhatsApp, despite its high transaction value of 19 billion dollars.[1] As a result, a growing number of jurisdictions have changed their notification thresholds to account for both turnover and transaction value, including Austria and Germany.

3.1. Identification of substitutes

The starting point of a competition assessment is to identify the overlapping products and geographical areas where the merging firms compete (CMA, 2014[60]) (European Commission, 2004[61]). As most firms usually produce multiple products at different development stages and sell them in a variety of regions, it would be impractical to assess the competitive effects of the merger on the full range of products and areas. A sensible solution is to focus the assessment on *close substitutes* that account for an important part of firms' business model, where the risk of short-term harm to consumers is higher. Yet applying this criteria alone could result in ignoring products that are at early development stages and which may bring great value for consumers in a few years.

In order to assess the dynamic effects of a merger beyond the very short term, some authorities look at the plans of the merging firms to develop new products or expand their business to new locations. If one of the firms has a product in the pipeline that may serve as a substitute to an existing or future product of the other firm, the merger could lead to a reduction in R&D expenses or even to the entire discontinuation of the pipeline product (e.g. *Pfizer/Hospira*[2] and *Nielsen/Arbitron*[3]) (European Commission, 2016[62]). Likewise, if one of the firms has plans to enter a geographical location where the other is already present, the merger could discourage investment or prevent entry all together. Information on product development and expansion plans can often be gathered from internal documents of the merging firms predating the merger notification (OECD, 2018[1]).

The analysis of competitive effects over a long timeframe may also require the identification of overlapping innovation *resources* or *capabilities* (Sidak and Teece, 2009[12]) (Katz and Shelanski, 2007[63]). Innovation resources are assets such as general purpose technologies, specialised laboratories, pools of skilled workers, natural resources and infrastructure that are fundamental to develop new products and processes. Looking at the resources owned by the merging firms often provides a better notion of the long-term competitive landscape than a mere analysis of commercialised products. Indeed, a merger between two firms owning valuable resources with few substitutes available can harm long-term innovation and investment (e.g. *Ciba-Geigy/Sandoz*).[4]

Once the main overlapping products and resources are identified, the most important step at this stage is to identify the competitors of the merging firms. The analysis should focus first on close competitors, as a merger is less likely to lessen competition when there are alternative close substitutes available in the market. In dynamic industries where products and resources are highly differentiated, imperfect substitutes can be another significant source of competitive pressure that reduce the risk of harmful effects. Moreover, whenever reliable information is available, it might be possible to consider potential or future competitors who have plans to enter the market within a relatively short timeframe. The degree of competition between the merging firms and their competitors can be quantified using "diversion ratio analysis" (Farrel and Shapiro, 2010[64]) (Box 2).

The identification of substitute products and geographical areas can also be used to define the relevant antitrust market (OECD, 2016[65]) (OECD, 2012[66]).[5] Market definition remains an important component of merger investigations, serving as a basis to calculate market shares and concentration indexes. When assessing dynamic effects of mergers, product market definition is arguably less important, as the precise boundaries of a market may change over time and the merger may affect markets that do not exist yet. Some academics have proposed to define future product markets (Baxter, 1984[67]) (Landman, 1997[68]) and innovation markets (Gilbert and Sunshine, 1995[69]), but these proposals do

not appear to have been implemented yet due to concerns of raising the subjectivity of merger review (Carlton, 1998[70]) (Rapp, 1995[71]).[6]

Box 2. Diversion ratio analysis

Diversion ratio analysis is one of the most common methods to quantify the degree of competition between substitutes. A diversion ratio measures "*the fraction of consumers that switch from one product to an alternative after a price increase*" (Conlony and Mortimer, 2019[72]). For instance, if the diversion ratio D_{12} between products 1 and 2 is 0.5, it means that given a marginal increase of the price of product 1, 50% of the customers who stop buying product 1 acquire product 2 instead. The value of a diversion ratio between substitutes is always positive and approaches one when there are no other close substitutes available in the market. Diversion ratios are calculated using own- and cross-price elasticities obtained either through demand system estimation or consumer surveys (Oxera, 2009[73]). Although normally used to measure the degree of competition between two substitute products, in theory it is also possible to apply diversion ratio analysis to innovation resources or capabilities.

$$D_{12} = -\frac{\partial Q_2/\partial P_1}{\partial Q_1/\partial P_1}.$$

3.2. Concentration analysis

Concentration analysis is one of the most commonly used tools to assess the effects of a merger, providing a first notion of the level of competition in a market. Concentration reflects the extent to which an economic activity, such as the production and sales of a good, is captured by a small number of firms (OECD, 1993[25]). Although the concept of concentration is normally applied to the analysis of a product market, one can also assess the concentration level of innovation resources, such as labs and patents, which again may provide a better idea of the long-term competitive landscape (e.g. *Bayer/Monsanto*).[7] The most commonly used (static) measures of concentration are market shares (X_i) and the Herfindahl-Hirschman index ($HHI = \sum X_i^2$), which ranges from 0 (perfectly competitive structure) to 10 000 (monopoly).

Most jurisdictions use concentration safe harbours as a screen to identify mergers that may require further analysis (DOJ & FTC, 2010[74]) (European Commission, 2004[61]). Generally, if the combined market shares of the merging parties and the HHI calculated at post-merger levels are below the safe harbours, authorities make a structural presumption that the merged entity has little market power and cannot harm competition. The use of safe harbours based on concentration measures – which are easy to calculate and require little information – enhances fast procedures and improves the allocation of authorities' resources to more problematic mergers (OECD, 2017[75]). To avoid the risk of mistakenly dismissing important cases (false negatives), it might be prudent to assess if a merger meets the safe harbours using a narrow market definition, which can then be reviewed at later stages of the assessment.

Despite their usefulness as an early-stage assessment tool, static measures of concentration are an imperfect indicator of market power and do not provide enough evidence to conclude *a priori* that a merger is anti-competitive (OECD, 2018[76]). A market may be concentrated not due to the lack of competition, but simply because economies of scale and network effects make a small number of firms more efficient. Also the strong position of the current market leaders might be temporary and only sustainable as long as they provide the best products at competitive prices. It would thus be premature to block a merger without

considering further evidence, as theoretical and empirical research has recurrently revealed that "*much inaccuracy can result from drawing strong conclusions from market concentration data*" (Cameron and Glick, 1996[77]).[8]

A dynamic analysis of concentration may provide a better notion of the degree of competition in a market, by reflecting the extent to which a small number of firms monopolises an economic activity over time (Box 3). As often quoted from the DoJ case against Syufy, "*in evaluating monopoly power, it is not market share that counts, but the ability to maintain market share*."[9] Therefore, competition authorities can overcome some of the limitations of a purely static analysis of concentration by looking at the evolution of market shares within a time period. "*The inability of large firms to maintain their market shares over a 'reasonably short' period could be persuasive evidence that these firms either had no monopoly power or that any power they might have had was only for the very short run.*" (Grossack, 1965[78])

While a dynamic analysis of concentration is certainly valuable, it also has some important limitations. The stability of market shares over time may suggest the existence of market power, but may also indicate that the market leaders consistently provided the best value to consumers in all periods of analysis. A possible solution to overcome this limitation is to try to assess whether market shares can be explained by current competitive behaviour, such as low prices and high quality, or whether market shares are merely explained by past success (Box 3). However, all these considerations may still not always provide a conclusive answer about the competitive effects of a merger, requiring authorities to conduct further steps of analysis.

Box 3. Dynamic measures of concentration

There are some dynamic measures of concentration proposed in the literature that are easy to calculate with little information, requiring only market share data for at least two periods (Grossack, 1965[78]). One good example of such measures is the coefficient of correlation (ρ) of the market shares in two different years. Another is the coefficient of a linear regression (β) of current market shares on the market shares of a previous year. Both of these coefficients range from zero – reflecting a competitive scenario where past market shares have no influence on future market shares – to one, suggesting a monopolised market where past market shares fully determine market shares in the future. The coefficients ρ and β can also be multiplied by 10 000 for an easier comparison with the HHI.

$$\beta = \frac{\sum_{i=1} X_{i,t} X_{i,t+1}}{\sum_{i=1} X_{i,t}^2}, \qquad \rho = \frac{\sum_{i=1}(X_{i,t} - \bar{X}_t)(X_{i,t+1} - \bar{X}_{t+1})}{\sqrt{\sum_{i=1}(X_{i,t} - \bar{X}_t)^2}\sqrt{\sum_{i=1}(X_{i,t+1} - \bar{X}_{t+1})^2}}.$$

A slightly more sophisticated analysis of concentration would entail running a regression of current market shares on past market shares, while controlling for relevant variables such as prices (P_{it}) and other product attributes. In this case, if the modified coefficient of past market shares on current market shares (β') is still statistically significant and large, there is more compelling evidence of market power. On the other hand, if current market shares are mostly explained by prices and other control variables, it is more likely that the market is competitive, even if some large competitors succeeded in maintaining a large market share over time.

$$X_{i,t+1} = \alpha + \beta' X_{i,t} + \gamma P_{i,t} + u_{i,t}.$$

3.3. Barriers to entry & exit

The assessment of barriers to entry and exit is one of the most important stages of merger review, determining whether a merger between close substitutes is likely to lessen competition when there are few alternative substitutes available. According to the long-established market contestability theory (Baumol and Willig, 1986[19]), even in highly concentrated markets, firms may have little or no market power, due to the constant threat of new entry (e.g. *ARM/G&D/Gemalto/JV*).[10] In contrast, in markets where barriers to entry and exit protect incumbents from new entrants, firms are more likely to have durable market power, which could be further aggravated by a merger (e.g. *General Electric/Alstom* Box 8).[11]

For the purpose of assessing market contestability, a barrier to entry can be defined as "*a cost that must be incurred by a new entrant and that incumbents do not or have not had to incur*" (McAfee, Mialon and Williams, 2004[79]).[12] Most barriers to entry result from regulations that give favourable treatment to incumbents, but other examples include patents, long-term contracts and control over scarce resources. Within this definition, economies of scale and network effects are not barriers to entry *per se*, because in the absence of sunk costs they do not preclude entrants from contesting existing market power (for instance by rapidly entering and exiting a market before incumbents have the chance to adjust prices).[13] Sunk costs, although not technically an entry barrier, are an important barrier to exit that may reduce market contestability (OECD, 2019[18]).[14]

While the assessment of a merger should ideally involve a rigorous analysis of the main barriers to entry and exit in the relevant market, in practice it is very hard to quantify such barriers with precision (Box 4). The estimation of excessive costs incurred by entrants is empirically complex and time consuming, posing a challenge for authorities with limited resources. In addition, it is often controversial what costs qualify as a barrier to entry or exit for the purposes of competition law (OECD, 2005[80]) (McAfee, Mialon and Williams, 2004[79]). The academic literature also provides little practical guidance on how to estimate entry and exit barriers, as so far "e*conomists unfortunately seem to have produced very little potentially relevant theory and essentially no systematic empirical analysis of factors that slow entry*" (Schmalensee, 2004[81]).

In light of these challenges, most competition authorities use indirect indicators, such as historical entry and exit rates, to assess whether entry post-merger is *likely*, *timely* and *sufficient* to address the competitive concerns (Box 4). "*The only truly reliable evidence of low barriers is repeated past entry in circumstances similar to current conditions. Indeed, repeated entry during a period of competitive prices makes entry even more likely in response to future attempts at monopoly pricing*" (Areeda and Hovenkamp, 1995[82]). While a high entry rate alone may simply suggest that a market is growing over time, or a high exit rate may imply that a market is declining, the combination of high entry and exit rates at the same time provides stronger evidence of fierce competition.

Apart from looking at historical evidence, some competition authorities do surveys to market participants, inquiring them about their intentions to enter the relevant market in the near future (Oxera, 2006[83]). As incentives to entry can change after a merger, authorities sometimes ask participants whether they would enter the market if prices increased by a certain amount. These surveys can nevertheless produce unreliable results and raise enforcement unpredictability, as market participants may have few incentives to reveal their true intentions to competition authorities, especially if the merger is likely to

affect them. Moreover, surveys cannot cover all potential competitors, who might be numerous and hard to identify, especially in markets with few entry barriers.

Where the quantification of barriers to entry and exit is challenging, a qualitative analysis alone can provide useful insights of the degree of competition and help deciding whether a merger deserves closer scrutiny. A qualitative analysis can also complement indirect evidence collected through historical data and surveys: for instance, information about a market liberalisation process or a regulatory regulation may suggest that historical entry rates either underestimate or overestimate the likelihood of future entry. Finally, the qualitative analysis of barriers to entry and exit also allow authorities to determine appropriate merger remedies and to identify fundamental structural problems that could require other forms of intervention, such as advocacy efforts for deregulation.

Box 4. Quantification of barriers to entry and exit

Although the literature offers little guidance on how to estimate barriers to entry and exit (Schmalensee, 2004[81]), it is possible to define quantitative measures based on proposed economic definitions (McAfee, Mialon and Williams, 2004[79]). A potential measure of barriers to entry is the coefficient of the excess costs incurred by an entrant ($TC_{Ent} - TC_{Inc}$) over its total costs (TC_{Ent}), that is, the share of the entrant's total costs that are not incurred by an incumbent. Likewise, a potential measure of barriers to exit is the coefficient of an incumbent's sunk costs (SC_{Inc}) over total costs (TC_{Inc}) or, in other words, the share of an incumbent's costs that are not recoverable. Both of these measures range from zero, reflecting a situation where entry and exit are absolutely free, to one, where entry and exit barriers are maximum.

$$Barriers\ to\ Entry = \frac{TC_{Ent} - TC_{Inc}}{TC_{Ent}}, \qquad Barriers\ to\ Exit = \frac{SC_{Inc}}{TC_{Inc}}.$$

As the previous measures are generally hard to obtain, the most commonly used indirect indicators of the size of entry and exit barriers are historical entry and exit rates. The entry rate is the share of new entrants within a time period, usually one year, out of the total number of firms. The exit rate is the share of firms that exited the market within the same time period out of the total number of firms. Both measures also range between zero and one.

$$Entry\ Rate = \frac{Number\ of\ Entrants}{Total\ Number\ of\ Firms}, \qquad Exit\ Rate = \frac{Number\ of\ Exiting\ Firms}{Total\ Number\ of\ Firms}.$$

An alternative indirect indicator of entry barriers is the weighted entry rate, which considers the size of the new entrants. While the simple entry rate may provide useful information about whether entry is *likely* to occur post-merger in a *timely* way, it says little about whether such entry would be *sufficient* to address the competitive concerns. If all the new entrants are small and unable to grow in scale, they may pose little or no competitive pressure on incumbents. In contrast, a weighted entry rate accounts for the sum of market shares (X) of all firms that entered within a recent time period. Using the same principles, it is also possible to calculate a weighted exit rate.

$$Weighted\ Entry\ Rate = \sum \mathrm{X}_i, \qquad i \in Entrants.$$

3.4. Unilateral & coordinated effects

The ultimate goal of a merger assessment is to predict whether the merger is likely to produce anti-competitive effects, which are generally classified in unilateral and coordinated effects. The previous stages of the analysis may have already provided enough evidence to predict the competitive effects of a merger, aside from the consideration of

efficiency claims. The risk of harmful effects is more evident when the merging firms control a substantial share of a product or resource for which there are few or no substitutes available, and barriers to entry and exit are considerably high. However, if the impact of the merger is still unclear at this stage, competition authorities may collect further evidence in order to better evaluate the risk of unilateral and coordinated effects.

Unilateral effects consist of the impact of a merger on the independent profit-maximising behaviour of the merging firms and their competitors, whose market power increases due to the elimination of a direct competitor (Ivaldi et al., 2003[27]). The risk of unilateral effects fundamentally depends on the level of competitive pressure exerted by close competitors and future entrants, factors that were already considered during the previous stages of the analysis. In addition, there are a number of dynamic factors that could affect the risk of unilateral effects in the medium to long term, such as:

- Imminent development of new technologies that will serve as substitutes to the products and resources of the merging firms (e.g. *Alcatel/Lucent*).[15]
- Ability of indirect competitors to reposition themselves in the market after the merger takes place.
- Expansion of small competitors, who may become a more viable source of competitive pressure in the future.
- Countervailing bargaining power of customers and suppliers in future negotiations.
- Forthcoming regulatory reforms that may change firms' incentives to compete.

Sometimes it is possible to quantify unilateral effects using standard techniques, such as pricing pressure tests, which can be easily modified to account for important dynamic effects (Box 5).[16] For instance, there are proposals to adapt pricing pressure tests to multi-sided markets by incorporating cross network externalities into the analysis (Brekke, 2018[84]). There are also attempts to develop innovation pressure tests that consider the merger impact on the ability of firms to appropriate innovation spillovers (Salinger, 2019[85]). In comparison to more complex techniques, such as merger simulation models (Ivaldi et al., 2003[27]), pricing and innovation pressure tests provide valuable information without requiring the estimation of demand curves and not relying on assumptions about the nature of the competitive equilibrium.

Coordinated effects consist of the impact of the merger on firms' incentives to synchronise strategies, either by recognising their mutual interdependency (tacit collusion) or by maintaining explicit agreements (explicit collusion) (OECD, 2017[86]). The assessment of coordinated effects usually involves a qualitative analysis of structural conditions known as the relevant factors for collusion, such as the number of firms and the existence of entry barriers (Ivaldi et al., 2003[28]). Again, competition authorities may consider a number of dynamic factors that might affect the risk of coordinated effects in the medium to long term, including:

- Technological changes and innovation activity that influence the stability of collusion.
- Tendency for competitors to differentiate themselves in dynamic markets, resulting in cost asymmetry that makes coordination harder.
- Increasing phenomenon of digitalisation that improves market transparency and makes collusion easier to monitor.

- Widespread use of pricing algorithms and other automated tools that reinforce firms' ability to maintain a collusive agreement (OECD, 2017[86]).
- Growing ability of firms to personalise prices, which makes collusion very hard to coordinate (OECD, 2018[87]).

Box 5. The UPP, GUPPI and NIP

The most popular methods to quantify unilateral effects are the *upward pricing pressure* test (UPP) (Farrel and Shapiro, 2010[64]) and the *gross upward pricing pressure index* (GUPPI) (Moresi, 2010[88]). Both methods predict the direction of a price change post post-merger using estimated diversion ratios (D) and price-cost margins ($P - C$), though they do not estimate by how much prices will vary. The UPP, on the one hand, balances the upward pricing pressure from a loss of competition against the downward pricing pressure from the cost efficiency (e) that the merger is deemed to generate. The sign of the UPP determines whether the merger is likely to create a net upward or downward pressure on prices. The GUPPI, on the other hand, measures only the gross upward pricing pressure associated with a loss of competition. Its value is therefore always positive and must be compared against some efficiency threshold.

$$UPP_1 = D_{12}(P_2 - C_2) - E_1 C_1, \qquad GUPPI_1 = \frac{D_{12}(P_2 - C_2)}{P_1}.$$

A recently proposed method to quantify unilateral effects on dynamic dimensions is the *net innovation pressure* test (NIP) (Salinger, 2019[85]). In a similar fashion to pricing pressure tests, the NIP predicts the direction of the merger impact on R&D expenses using estimated diversion ratios, but it does not determine by how much R&D expenses will vary. A fundamental difference is that the NIP balances the downward innovation pressure from the loss of competition against the upward innovation pressure from the internalisation of innovation spillovers (s). The sign of the NIP indicates whether a merger is likely to increase or decrease innovation efforts.

$$NIP_1 = \frac{[1 - D_1 + s_1(1 - D_2)]}{1 - s_1 D_2}.$$

Notes

[1] *Facebook/WhatsApp*, Case M.7217, Commission decision of 03/10/2014, https://ec.europa.eu/competition/mergers/cases/decisions/m7217_20141003_20310_3962132_EN.pdf.

[2] "*[I]n the Pfizer/Hospira merger, the Commission found that the proposed transaction raised competition concerns because Pfizer was developing a competing medicine to Hospira's. Specifically, Hospira was selling Inflectra, an infliximab biosimilar used to treat several chronic inflammatory diseases, notably the inflammation of Crohn's disease, while Pfizer was in an advanced stage of developing its own biosimilar for infliximab. The Commission was concerned that Pfizer would likely discontinue its efforts to bring its new medicine to market, reducing competition. As a remedy, Pfizer divested its development programme.*" (Schulz, 20118[119])

Pfizer/Hospira, Case M.7559, Commission decision of 04/08/2015, https://ec.europa.eu/competition/mergers/cases/decisions/m7559_20150804_20212_4504355_EN.pdf.

[3] "*In Nielsen/Arbitron, Nielsen offered a leading TV audience measurement service, while Arbitron offered a leading radio audience measurement service. At the time of the merger, both were developing a cross-platform audience measurement service. The FTC challenged the merger, alleging harm to innovation.*" (Schulz, 2018[120])

Nielsen Holdings N.V./Arbitron Inc., Federal Trade Commission order No. 131 0058, http://www.ftc.gov/enforcement/cases-proceedings/131-0058/nielsen-holdings-nv-arbitron-inc-matter.

[4] In 1997, the FTC settled a consent agreement with Ciba-Geigy and Sandoz, allowing the parties to merge into a new company called Novartis. One of the FTC concerns was that the merger would reduce competition in R&D and innovation in the market for gene therapy. As the market for gene therapy products did not exist yet at the time of the merger, the FTC looked at the innovation capabilities and resources of the merging parties. Ciba and Sandoz were one of the few, if not the only firms, with the technological capabilities and intellectual property rights required to develop gene therapy products.

CIBA-Geigy Limited/Sandoz Ltd./Novartis AG., No. C-3725, FTC Decision and Order of 24/03/1997, https://www.ftc.gov/enforcement/cases-proceedings/961-0055/ciba-geigy-limited-sandoz-ltd-novartis-ag-et-al-matter.

[5] Market definition consists in the process of determining the boundaries of a market in two fundamental dimensions: the relevant product market, that is, a set of substitute products that are acquired interchangeably by consumers, provided they are sold in the same location; and the relevant geographical market, that is, the geographical area where consumers shop around for the same product (OECD, 2003[129]). The intersection between a product market and a geographical market gives the relevant antitrust market.

[6] A future product market is a market for the development of a specific product that does not exist yet. An innovation market is a market for substitute R&D projects that may yield similar results, even though their outcome might be largely unknown. The main objective of defining future product and innovation markets is to assess the competitive effect of a merger on innovation efforts.

[7] In *Bayer/Monsanto*, the Commission concluded that the merging parties had a significant combined share of patents in several innovation spaces, which would have led to a significantly increased concentration.

Bayer/Monsanto, Case M.8084, Commission decision of 21/03/2018, https://ec.europa.eu/competition/elojade/isef/case_details.cfm?proc_code=2_M_8084.

[8] In some jurisdictions, such as the US, there are rebuttable structural presumptions that mergers that increase concentration beyond an established threshold are harmful. In those cases, the burden of proof lies on the parties, who must provide evidence that the merger would create efficiencies and not result in consumer harm.

[9] *United States v. Syufy Enters*. 903 F.2d 659, 665-66 (9th Cir.1990).

[10] The European Commission cleared the joint venture between ARM, G&D and Gemalto after concluding that barriers to entry were low and that there were a number of strong actual or potential competitors, despite the fact that the parties would have held a 70% to 80% market share under a narrow market definition.

ARM/Giesecke&Devrient/Gemalto/JV, Case M.6564, Commission decision of 06/11/2012, https://ec.europa.eu/competition/mergers/cases/decisions/m6564_20121106_20212_2779342_EN.pdf.

[11] In *General Electric/Alstom*, the Commission concluded that the market for heavy duty gas turbines (HDGT) is not only concentrated, bus also characterised by high entry and exit barriers associated to intellectual property rights and sunk costs in R&D. As a result, the Commission required the merging parties to divest part of the HDGT business (see Box 8).

General Electric/Alstom, Case M.7278, Commission decision of 08/09/2015, https://ec.europa.eu/competition/mergers/cases/decisions/m7278_6808_3.pdf.

[12] There are alternative definitions of barriers to entry in the economic literature. Two of the most popular definitions classify a barrier to entry as *"an advantage of established sellers in an industry over potential entrant sellers"* (Bain, 1956[127]) or as "*a cost of producing (...) that must be borne by firms seeking to enter an industry but is not borne by firms already in the industry"* (Stigler,

1968[117]). As the definitions proposed by Bain and Stigler have resulted in controversy among economists and competition lawyers, this paper uses a more modern and broader definition that has been proposed to resolve such controversies, which classifies a barrier to entry as "*a cost that must be incurred by a new entrant and that incumbents do not or have not had to incur* (McAfee, Mialon and Williams, 2004[79]). Sometimes, competition authorities also consider barriers to entry as any cost that delays entry, though the existence of such barrier does not imply that a market is incontestable and *"does not necessarily mean that a merger should be disallowed"* (McAfee, Mialon and Williams, 2004[79]).

[13] "It is now widely recognised that fixed costs must be sunk if they are to deter entry credibly" (Geroski, 1995[125]).

[14] By analogy with the definition of barriers to entry, barriers to exit are *costs incurred by exiting firms that firms outside the market do not or have not had to incur*, therefore comprising sunk costs. Some competition authorities classify sunk costs and other barriers to exit as barriers to entry in a broader sense. Sunk costs are also sometimes classified as an impediment to entry, in the sense that they may delay entry into a market for a significant time period (Baker, 2015[126]).

[15] In 2006, the Canadian Competition Bureau investigated the Alcatel's worldwide merger with Lucent Technologies (OECD, 2007[2]). Despite the high combined market shares of the merging parties, the Bureau concluded that the merger would not substantially lessen competition in the relevant product market, primarily because the technology upon which the product was based was being replaced by new technologies.

[16] Pricing pressure tests were initially developed as an alternative screen to the current methods based on market definition (Farrel and Shapiro, 2010[64]).

Chapter 4. Dynamic efficiency claims

Mergers that raise immediate competitive concerns may still have a positive net effect on consumer and total welfare in the long term, as long as efficiency gains are sufficiently large to compensate for any temporary loss of competition. For that reason, even when the competitive assessment described in Chapter 3. suggests that a merger is anti-competitive, in many jurisdictions the parties can build an efficiency defence to convince the competition authority or the court that the merger should be allowed. At this stage, the onus of the proof lies on the parties, who must provide evidence that the efficiency effects are verifiable, merger-specific and, in the case of jurisdictions with a consumer welfare standard, likely to be passed-through to final consumers.

This section identifies some of the most important dynamic efficiency effects of mergers, as well as the conditions under which they are likely to be observed. First, the section discusses how economies of scale, which are often considered an important static efficiency, can also increase dynamic efficiency by reducing the costs of innovation activity. Second, the section addresses innovation synergies, explaining how a merger can solve appropriability problems and thereby enhance innovation. Lastly, the section examines the efficiency effects of mergers as profitable exit strategies, focusing in particular on the failing firm defence and on the entrepreneurial exit argument.

4.1. Economies of scale

The most common static efficiency claim in horizontal merger cases is the realisation of economies of scale, that is, the reduction of average costs due to an increase in the scale of production (OECD, 1993[25]). Firms normally achieve economies of scale by saving fixed costs through the sharing of common assets (e.g. facilities, equipment, distribution networks, financial resources, management, IPRs, etc.) and by improving their level of specialisation through *learning by doing*. Economies of scale enable firms not only to reduce average production costs of existing products, but also to reduce the costs of innovation activity for the development of new products and processes, a form of efficiency that is particularly relevant in dynamic markets (e.g. *Genzyme Corporation/Novazyme Pharmaceuticals, Inc.*).[1]

As a result of economies of scale, horizontal mergers often increase the overall level of static efficiency, particularly in markets with few entry restrictions. As the economic literature has for long established, when firms incur fixed set-up entry costs, there is a tendency toward excessive entry due to the replication of fixed costs (Mankiew and Whinston, 1986[89]) (Perry, 1984[90]) (Von Weizsäcker, 1980[91]). A horizontal merger that reduces the total number of competitors towards the optimal level would therefore improve static efficiency. However, this does not need to be always the case as, when concentration is very high, the number of firms might be inefficiently small (Mankiew and Whinston, 1986[89]) and a merger could further reduce efficiency.

The net effect of a horizontal merger ultimately depends on a trade-off between different dimensions of static efficiency (OECD, 2012[92]) (Williamson, 1968[93]). On the one hand, a merger is likely to increase *scale efficiency* by enabling the parties to raise the volume of production towards the minimum efficiency scale. On the other hand, the merger may harm *allocative efficiency* if it increases the market power of the merging firms, enabling them to raise prices and restrict output below the social optimal. In some occasions, an increase in market power may further lead to a reduction in *technical efficiency*, by eliminating incentives of firms to minimise production costs (Leibenstein, 1966[94]).

There are quantitative methods available to evaluate how a merger affects static efficiency on a case-by-case basis, some of them already tested and replicated in the economic literature. One of the most popular methods is the *data envelopment analysis* (DEA), a useful tool to measure technical, allocative and scale efficiency effects using cross-sectional or panel data about multiple inputs and outputs of production (OECD, 2012[92]) (Kaur and Kaur, 2010[95]) (Kwoka and Pollitt, 2010[96]). Another method often implemented by competition authorities is known as the *compensating marginal cost reduction* (CMCR), which uses information about price-cost margins and diversion ratios to estimate the cost efficiencies required to offset the market power effect of a merger (OECD, 2012[92]).

Whether scale efficiencies are likely to lead to a successful efficiency defence fundamentally depends on the welfare standard of the jurisdiction. While under a total welfare standard it is enough to show that a merger raises efficiency, under a consumer welfare standard the parties must provide further evidence that the efficiency gains would be passed through to consumers, for instance through a lower price or output expansion. For that reason, most authorities do not accept efficiency claims that a merger would enable the parties to cut down costs in R&D activities (e.g. *Dow/DuPont* – Box 6). It would be equally necessary to show that, as a result of the lower unit cost of R&D, the merging firms would likely increase their innovation efforts (measured by total R&D expenses) or the innovation output (measured, for instance, by the number of new products introduced).

Box 6. The *Dow/DuPont* case

In December 2015, Dow Chemical Company ("Dow") and E.I. du Pont de Nemours & Company ("DuPont") announced their intention to complete a merger of equals, which was notified both to the US Federal Trade Commission (FTC) and the European Commission. DuPont and Dow are US-based multinational chemical corporations, active in the markets for acro-chemicals, seeds, food ingredients, paints, plastics, polymers and other materials.

The activities of the Dow and DuPont *overlap* in certain segments of the crop protection industry in Europe, as the two companies supply similar products, develop *competing pipeline products* and possess *substitute innovation resources* for the development of new crop protection products. Prior to the merger, there were only five companies worldwide with the necessary capabilities to do all the stages of the innovation process (discovery, development, registration and route-to-market). In certain sub-segments of the industry, only four or less of the five companies are active.

The merger would lead to a substantial increase in the *concentration* of sales and innovation activity in the crop protection market. The merging parties have not only a large combined market share of several crop protection products and R&D expenditures, but they also own a substantial share of the relevant patent rights. In addition, there are significant common shareholdings across the five competitors, increasing the *de facto* concentration of the market.

The crop protection market is characterised by high *barriers to entry and exit*, as the sunk costs of discovering, developing and registering new products are very high and have been rising sharply

over time, affecting disproportionally new entrants. This is particularly the case of the EU, where the regulatory environment recently became stricter.

The Commission concluded that the merger could have *unilateral effects* on both static and dynamic dimensions. Firstly, the merger would impede effective competition in certain pesticides and petrochemical products, resulting in higher prices and reduced choice. Secondly, the merger would likely reduce R&D spending, potentially reducing innovation in the development of new pesticides.

The parties argued that the merger would enable them to achieve *economies of scale* by eliminating redundant duplication of R&D assets, as well as to appropriate *innovation spillovers*. Both efficiency claims were rejected due to the lack of concrete evidence that they would be verified. The Commission also noted that economies of scale related to cost savings with R&D cannot be considered as efficiencies that benefit consumers. Moreover, the appropriability of innovation spillovers appeared to be already high pre-merger, as the crop protection industry is characterised by strong patent rights protected over a long time period (25 years).

The merger was conditionally cleared. In order to address the competitive concerns, the parties committed to *divest* a significant part of DuPont's pesticide business, including its R&D unit, as well as Dow's acid co-polymer and ionomers businesses.

Source: *Dow/DuPont*, Case M.7932, Commission decision of 27/03/2017, https://ec.europa.eu/competition/mergers/cases/decisions/m7932_13668_3.pdf.

4.2. Innovation spillovers

The appropriation of spillovers from innovation activity is one of the most important, if not the main, dynamic efficiency effect of mergers (Shapiro, 2012[97]) (Katz and Shelanski, 2007[63]). Spillovers are the side effect or externality of a firm's innovation activity on a third party, and they may occur either due to the involuntary leakage or the voluntary exchange of technological information (Bondt, 1996[98]). In dynamic markets where innovation activity plays an important role, horizontal mergers may allow firms to internalise spillover effects and raise the return on investment of R&D, thereby increasing innovation incentives.

> *"What is distinctive about R&D is that to these (...) scale economies problems is added what is often referred to as appropriability problems. They are sometimes referred to as externalities problems. These are really two versions of the same problem. If the R&D for the single firm is not appropriable, the initial incentives to do the R&D are reduced." (Spence, 1984[30])*

The ability of a firm to appropriate spillovers from a successful innovation depends on how easy it is for a competitor to imitate or replicate that innovation. If the technology is such that reverse engineering is almost impossible, firms can easily protect their innovations through business secrecy and thereby eliminate spillovers on competitors. Likewise, if new technologies are patentable, a successful innovator can either prevent competitors from using the same technology (e.g. Dow/DuPont – Box 6), or profitably exchange the technological information through a licensing agreement. Hence, the appropriability problem only arises in industries where intellectual property rights are hard to enforce and business secrecy is not a viable option.

In industries where firms cannot appropriate spillovers from innovation, mergers may create a trade-off between dynamic and static efficiency (Williamson, 1968[93]). On the one hand, a merger may improve dynamic efficiency by encouraging firms to invest in R&D projects that expand the technology frontier and bring substantial economic benefits for consumers and producers. On the other hand, the merger may reduce static efficiency by

increasing market power, which disproportionally harms consumers. Balancing this trade-off involves making a judgment of how much present harm to consumers is acceptable to compensate for a marginal increase in the probability of future innovation.

The quantification of innovation spillovers may provide useful information about whether a merger is likely to increase dynamic efficiency (Box 7). Some empirical studies find that spillovers are, indeed, an important motivation for firms to co-operate in R&D projects through mergers, consortia and joint ventures (Cassiman and Veugelers, 2002[99]) (Branstetter and Sakakibara, 2002[100]) (Entezarkheir and Moshiri, 2018[101]). The comparison of dynamic and static effects is nonetheless a challenging exercise, as it is not clear how to balance an uncertain effect of the merger on future innovation against an immediate price change (OECD, 2007[2]). It is thus not surprising that many authorities are reluctant in accepting efficiency claims that are not verifiable in the shorter term.

Lastly, it is important to consider whether the appropriation of innovation spillover could not be achieved through other means, that is, whether the efficiency is merger-specific. Some empirical evidence in the semiconductor industry suggests that the dynamic efficiency gains caused by mergers could be achieved instead through research joint ventures (RJV) (Gugler and Siebert, 2007[102]). At the same time, "*a RJV would be less anti-competitive than a full merger, as it would preserve price competition in the current and future product market*" (Federico, Morton and Shapiro, 2019[103]). For that reason, competition authorities are usually more likely to accept such dynamic efficiency claims in the context of RJVs.

Box 7. Quantification of innovation spillovers

A simple way to quantify the size of innovation spillover effects in an industry is to compare the average cost of creating an innovation (C_{INV}) with the average cost of imitating or replicating the same innovation (C_{REP}) (Salinger, 2019[85]). This information can be used to calculate the spillover rate, which is the ratio of the differential between the two costs over the innovation cost. The spillover rate is negative when the imitation cost exceeds the innovation cost – a likely situation in industries with strong protection of intellectual property rights – and positive when the innovation cost exceeds the imitation cost. If the cost of replicating an innovation is zero, the spillover rate is 100%, meaning that the innovation can be immediately and fully misappropriated by competitors. For a merger to increase innovation incentives, the spillover rate must be positive and sufficiently large to offset any market power effects.

$$Spillover\ Rate = \frac{C_{INV} - C_{REP}}{C_{INV}}.$$

4.3. Market exit

Another fundamental dynamic effect of mergers is to facilitate market exit and thereby to promote new entry (Henkel, Rønde and Wagner, 2015[40]) (Sokol, 2018[33]). In some cases, mergers accelerate the exit of inefficient firms, allowing them to sell industry-specific assets and to recoup invested costs that would otherwise be unrecoverable. In other cases, mergers facilitate the exit of successful innovators, by enabling them to profitably sell a technology or idea to large-scale incumbents. Either way, by facilitating exit, mergers promote the entry of new competitors that may bring new innovations to the market, as "*the likelihood of exit with minimum loss or maximum gain increases the attractiveness and reduces the risk of entering a market*" (Areeda, Kaplow and Edlin, 1988[104]).

Despite the unquestionable importance of entry and exit for a dynamic competitive process, it is difficult to determine when a problematic merger should be cleared on the grounds that it facilitates market exit. One of the main challenges is that there is no well-accepted methodology to calculate the dynamic efficiency gains of mergers as exit strategies. Even if such long-term gains could be quantified, it would still be unclear how to balance them against the shorter-term anti-competitive impact of the merger. There are, nevertheless, specific circumstances under which the overall benefits of market exit are more evident, namely when mergers facilitate the exit of a failing firm or the profitable exit of a successful entrepreneur.

Market exit is a plausible dynamic efficiency when the acquired party is a *failing firm* that would exit the market anyway (e.g. *ArcelorMittal/Ilva*).[2] A failing firm can be defined as one "*that has been consistently earning negative profits and losing market share to such an extent that it is likely to go out of business*" (OECD, 1993[25]). The failing firm defence usually requires three cumulative conditions to be verified: (1) the firm exits due to failure or financial difficulties; (2) there is no alternative transaction or reorganisation that is less anti-competitive; and (3) absent the merger, the assets of the failing firm would inevitably exit the market (OECD, 2016[105]). The US FTC considers a similar defence when a "*distressed firm is declining and its continuing decline would bring the merged entities' market share below the threshold of presumptive illegality*" (Steren and Wagner, 2018[106]).

Market exit is also likely to promote dynamic efficiency in circumstances where a high-value acquisition rewards an entrepreneur for a successful innovation. In this case, the expectation of a profitable exit strategy encourages new entrepreneurs to engage in capital ventures and risky R&D projects that may lead to radical innovations (Henkel, Rønde and Wagner, 2015[40]). *"Entrepreneurial exit is critical to a well-functioning entrepreneurial ecosystem, as the possibility of entrepreneurial exit via vertical merger is now the most usual form of liquidity event/exit for founders and venture capitalists"* (Sokol, 2018[33]). While entrepreneurial exit is still not a well-established efficiency claim, so far competition authorities appear to have taken a more lenient approach to major acquisitions of relatively young and small entrants.

Notes

[1] In 2004, the US Federal Trade Commission did an investigation of the 2001 merger between Genzyme Novazyme, which were engaged in early pre-clinical studies to find a treatment for Pompe disease. Despite the fact that this case was a merger to monopoly, the FTC found no evidence that the merger reduced R&D spending or slowed the innovation progress, resulting instead in relevant efficiency effects. In particular, FTC's Chairman noted that the merger "*made possible comparative experiments and provided information that enabled the Novazyme program to avoid drilling dry holes. By accelerating the Novazyme program, the merger may have increased its odds of success. Moreover, the merger made possible synergies that will help avoid a delay in the Novazyme program*."

Genzyme Corporation/Novazyme Pharmaceuticals, Inc., File No. 021 0026, FTC decision of 13/01/2004, https://www.ftc.gov/news-events/press-releases/2004/01/ftc-closes-its-investigation-genzyme-corporations-2001.

[2] In 2018, the Commission conditionally cleared the acquisition by ArcelorMittal, the Europe's leading flat carbon steel manufacturer, of the main production assets of the Italian competitor Ilva, which qualified as a failing firm. Prior to the merger, Ilva had been making losses for several years, as its low scale of production was not enough to cover the required environmental investment and other fixed costs. In 2015, Ilva initiated insolvency proceedings and a competitive tender was launched to sell its assets. *ArcelorMittal/Ilva,* Case M. 8444, Commission decision of 07/05/2018, https://ec.europa.eu/competition/mergers/cases/decisions/m8444_5885_4.pdf.

Chapter 5. Remedies to dynamic effects

Merger remedies are one of the main enforcement tools used by authorities to address the harmful effects of mergers, sometimes sufficing to restore effective competition in both the short and long term. When mergers have conflicting static and dynamic effects (e.g. a merger that restricts price competition but promotes R&D investment), remedies are a possible solution to eliminate competitive concerns while still allowing the merger to realise important efficiency effects. At the same time, designing adequate remedies in fast evolving markets is challenging and not always a viable solution, as *"[r]emedies can be too restrictive on contract freedom, or, on the other hand, not protect competition enough – both restricting innovation"*[1] (Kartner, 2016[107]).

This section describes the main advantages and limitations of different merger remedies, discussing how they might be designed and adapted to better address competitive concerns within a dynamic environment. Remedies are usually classified in structural and behavioural (or conduct), and they can either be applied in isolation or combined into a hybrid remedy (OECD, 2013[108]) (OECD, 2011[3]). This section focuses first on the use of structural remedies, which are usually seen as a more effective option to permanently address the competitive risks of horizontal mergers. Then the section considers the use of behavioural remedies as an alternative flexible tool to minimise harmful effects on innovation in some cases.

5.1. Structural remedies

Structural remedies are divestiture measures through which the merging firms sell part of their assets to one or more third parties (OECD, 2011[3]). In some cases, authorities require the merging firms to divest a standalone business unit with all the necessary assets for its operation, including tangible assets (e.g. factories, personnel, manufacturing equipment, laboratory facilities) and intangible assets (e.g. know-how, intellectual property, licenses, permits, financial information). In other occasions, the merging firms must divest only a smaller subset of assets (e.g. *Hutchison 3G Italy/Wind/JV*).[2] Either way, the structural remedy must be viable, in the sense that enables the purchaser to integrate the divested components into its own operation and to effectively compete on a lasting basis (ICN, 2016[109]).

Structural remedies are often an effective solution to permanently address not only static but also dynamic anti-competitive effects of horizontal mergers, without necessarily compromising efficiencies. Structural remedies that preserve competition on dynamic dimensions include the divestment of innovation resources or capabilities (Katz and Shelanski, 2007[63]), such as IPRs and global R&D units (e.g. Dow/DuPont – Box 6). Indeed, by requiring the merging firms to divest overlapping assets for which there are few substitutes available, structural remedies are often a less intrusive intervention than a full prohibition decision. Moreover, in comparison to behavioural remedies, they do not require monitoring by authorities (OECD, 2011[3]).

The design and implementation of structural remedies to solve dynamic concerns is nevertheless a challenging task. One difficulty is to determine the exact assets that should be divested, as it is often unclear what intellectual property rights, human capital and other assets will be crucial for competitors to innovate in the future (Katz and Shelanski, 2007[63]). Another challenge is to identify a suitable purchaser who possesses the financial means and industrial expertise to become a viable competitor (ICN, 2005[110]), which might be especially hard when future market developments are still uncertain. In light of these challenges, competition authorities may consider market-testing the proposed divestitures and appointing an expert trustee (e.g. investment bank, consulting firm) to implement the remedy (OECD, 2011[5]).

Although structural remedies are a powerful tool to address the risks of horizontal mergers, they have some limitations, including being inflexible and irreversible. As a result of their one-off nature, structural remedies do not adapt to market circumstances and, once implemented, a divestment might be very costly or even impossible to reverse. This might be problematic in dynamic industries where market conditions constantly change over time, potentially making a remedy inadequate to address the competitive concerns originally foreseen. As an example, if technological changes make a divested asset obsolete, the remedy may turn out insufficient for the purchaser to exert effective competitive pressure on the merging firms.

There are some proposals in the literature to make structural remedies more flexible, including the design of alternative remedies conditional on the evolution of the market post-merger (e.g. *EDF/Segebel*).[3] *"In an innovative market, where competition authorities may not be, at the time of a transaction, in a position to accurately predict the evolution of the market (…), regulators could arguably accept to make merger remedies conditional on the realisation of certain events within a certain timeframe"* (Bure and Bary, 2017[111]). This way, the remedy would only take place *if* and *when* the competitive concerns become clearer, at which point the authority and merging parties could eventually renegotiate the most appropriate divestment measure. Examples of market events that could trigger the implementation or renegotiation of a structural remedy include:

- Lack of entry of new competitors with alternative technologies within a defined timeframe.
- Increase of the market share of the merging firms beyond an established threshold.
- Variation in prices, investment or R&D effort above a pre-defined value.
- Inability of the merging firms to find a suitable purchaser within the agreed deadline.
- Observation of a regulatory reform that alters competitive conditions.

Structural remedies conditional on future market events have also some important limitations. Firstly, conditional remedies may increase legal uncertainty for the merging parties, who do not know whether they will be subject to future remedies. Secondly, the remedies may be harder to implement when the merger has been consummated and the merging parties are fully integrated (the so-called "unscrambling the eggs" problem). Thirdly, conditional remedies may raise regulatory costs for the parties and the competition authority, who has to review the merger twice.

5.2. Behavioural remedies

Behavioural remedies, also known as conduct or non-structural remedies, aim at regulating the business conduct of the merging firms, either by obliging or by prohibiting specific actions (OECD, 2019[112]). Their main purpose is hence not to limit market concentration, but to prevent the merging firms from exerting market power post-merger. Due to their nature, behavioural remedies are generally more appropriate to address the competitive risks of vertical and conglomerate mergers, preventing the merging parties from engaging in anti-competitive behaviours such as foreclosure or tying (OECD, 2019[4]). In rarer cases, behavioural remedies are also considered a flexible tool to deal with the uncertain dynamic effects of horizontal mergers.

The most common behavioural remedies are access remedies, such as compulsory licensing of IPRs (e.g. *Shell/BASF/JV*)[4] and other measures requiring the merging firms to provide a competitor with access to a resource, such as a lab infrastructure, a network or a key technology (e.g. *Ticketmaster/Live Nation*).[5] Similar to structural remedies, this type of remedies prevents the merging firms from monopolising a resource for which there are few substitutes, reason why they are also known as "quasi-structural" remedies. In contrast with structural remedies, behavioural remedies do not require any actual divestiture to take place and may thus be revised or eliminated after a time period. Another difference is that behavioural remedies may oblige the merging firms to grant access to multiple competitors on non-discriminatory terms, potentially fostering new market entry.

Despite their greater flexibility, behavioural remedies have more significant limitations than structural remedies and should only be used in exceptional circumstances. Firstly, behavioural remedies generally impose on the merging firms an obligation to act against their economic interest, requiring a burdensome monitoring by authorities (OECD, 2011[3]). Moreover, it is hard to design behavioural remedies that anticipate all future eventualities, especially in evolving markets where constant changes can make the remedy redundant or counterproductive. *"In a changing environment, behavioural remedies usually require ongoing revision and adaptation in order to avoid becoming ineffective and/or detrimental to the competitive process"* (Maier-Rigaud, 2016[113]).

When designing behavioural remedies to address long-term effects of mergers, competition authorities might consider introducing review clauses that allow the remedy to adapt to changing market conditions. For the review or adjustment clauses to be effective, it is important to determine in advance the trigger events that would automatically modify the remedy provisions or fully release the parties from the obligations imposed by the remedy (Bure and Bary, 2017[111]). Nonetheless, while review clauses can help maintaining the effectiveness of a behavioural remedy over time, they also reinforce the ongoing engagement of the authority, potentially resulting in a merger control regime with a stronger regulatory component.[6]

Apart from being applied in isolation, behavioural remedies are sometimes used in conjunction with structural remedies to facilitate the implementation of divestiture measures, resulting thus in a hybrid remedy (e.g. *Ticketmaster/Live Nation*[7] and *General Electric/Alstom* – Box 8). These supplementary behavioural remedies typically require the merging firms to provide short-term technical support and transitional services to the acquirer of the divested asset (FTC & DoJ, 2011[114]). Although potentially more appropriate to deal with the horizontal effects of mergers, hybrid remedies also have two significant limitations. Firstly, the merging firms may have few incentives to effectively collaborate with an acquirer who is or will soon become a direct competitor. Secondly, the

close collaboration between the merging firms and the acquirer could induce collusion in the future after the divestiture takes place (Motta, Polo and Vasconcelos, 2007[115]).

Box 8. The *General Electric/Alstom* case

In April 2014, General Electric (GE) announced its acquisition of Alstom's energy-related business divisions. GE is a US-based global conglomerate operating in multiple industries, including energy, aviation, health care, finances, software, oil and gas. Alstom is a French multinational that used to have four business divisions: Thermal Power, Renewable Power, Grid (energy transmission and distribution) and Transport. After selling the three former business divisions to GE, Alstom kept the Transport division and continued operating in the rail transport market worldwide. The merger was notified both to the US Department of Justice (DoJ) and the European Commission.

While GE and Alstom have many *overlapping activities*, the investigation focused on heavy duty gas turbines (HDGT). The Commission concluded that the merging parties are close competitors in the supply of HDGT, based on a qualitative assessment of internal documents and a quantitative analysis of bidding data (bidding frequency, winning probability and bidding margins). The two merging parties have also substitute R&D spending, innovation capabilities and HDGT pipeline products. A market survey to competitors and customers provided evidence that past innovation by Alstom has pressured its competitors to innovate. Apart from GE and Alstom, there are only two other globally active competitors with the same relevant technology capacity.

The HDGT market is highly *concentrated* and differentiated. As GE is the market leader and Alstom is the third biggest company, the merger would result in high combined market shares, as well as a significant concentration of production and innovation capacity.

The very high profit margins of HDGT products suggest that the market is not only concentrated, bus also characterised by high *entry and exit barriers*. Most important entry barriers in this market are intellectual property rights, while exit barriers include sunk costs in R&D. The Commission also concluded that repositioning in the markets for HDGTs is difficult, lengthy and costly, which may delay the entry of new competitors.

The Commission concluded that the merger could have *unilateral effects* on both static and dynamic dimensions. On the one hand, by reducing the limited number of alternative HDGT products available, it could have an adverse effect on prices and product choice. On the other hand, the merger could reduce competition on innovation and lead to the discontinuation of Alstom's R&D.

While Alstom did not meet the conditions for a *falling firm defence*, the parties argued that, in the absence of the merger, Alstom would lose its competitiveness in the long-term, due to financial and structural difficulties. The parties also argued that the merger would enable cost savings from *economies of scale*. However, the Commission concluded that the efficiency claims were not verifiable, merger-specific or likely to benefit consumers.

The merger was cleared on the condition that GE *divested* the technologically most advanced parts of Alstom's HDGTs business to its Italian competitor, Ansaldo Energia. To maintain the viability of the divested assets, the remedy package required Alstom's engineers to continue developing Alstom's pipeline technologies.

Source: *General Electric/Alstom*, Case M.7278, Commission decision of 08/09/2015, https://ec.europa.eu/competition/mergers/cases/decisions/m7278_6808_3.pdf.

Notes

[1] "*Should there be no clear theory of harm and no facts to support such a determination, aggressive intervention risks chilling procompetitive innovation. In some cases the best remedy may be no remedy."* (Sokol, 2014[118])

[2] In 2016, the European Commission approved a telecommunications joint venture between Hutchison and VimpelCom, the third and fourth largest telecom operators in Italy. The parties committed to divest certain assets (namely mobile radio spectrum and mobile base station towers) to the French telecommunications operator, Iliad, so that the latter could enter the Italian market. The divestment package contained a transitional agreement allowing the purchaser to use the joint venture's network until its new mobile network is built. The Commission found that the proposed structural remedies would preserve effective competition, maintaining incentives to invest in innovative technologies.

Hutchison 3G Italy/Wind/JV, M.7758, Commission decision of 01/09/2016, https://ec.europa.eu/competition/mergers/cases/decisions/m7758_2937_3.pdf.

[3] In 2009, the European Commission conditionally cleared the acquisition by EDF of Segebel. The main competitive concern was that the merger would reduce the incentive of EDF to invest in additional electricity generation capacity in Belgium post-merger. In order to address the competitive concern, the Commission implemented a two-step remedy package. Firstly, the remedy involved an immediate divestment of one of EDF's power station projects. Secondly, EDF committed, by a certain date, to either invest in the project for a second power station, or to divest that power station project altogether.

EDF/Segebel, M.5549, Commission decision of 12/11/2009, https://ec.europa.eu/competition/mergers/cases/additional_data/M.5549_1015_5.pdf.

[4] In 2000, the European Commission cleared the joint venture between Shell Petroleum N.V. and BASF Aktiengesellschaft, subject to a number of commitments including compulsory licencing. The joint venture brought together the two most important players in the market for polypropylenes and polyethylenes, resulting in combined market shares two to three times bigger than those of the main competitors. In addition, the merger substantially strengthened the parties' combined patent position. In order to address the competitive concerns, the parties committed to license the BASF/Targor patents to all third parties, and not to enforce these patents against third parties who license the technology from other competitors.

Shell/BASF/JV-Project Nicole, Case M.1751, Commission decision of 29/03/2000, https://ec.europa.eu/competition/mergers/cases/decisions/m1751_en.pdf.

[5] In the settlement of the *Ticketmaster/Live Nation* merger, the parties agreed to license a copy of its ticketing software to two competitors. Within five years, the competitors could either purchase the licensed software or partner with another ticketing company. This remedy would allow the competitors to offer an attractive ticketing system, enhancing competition in both the short and long term.

U.S., et al. v. Ticketmaster Entertainment, Inc., et al., Case: 1:10-cv-00139, (DDC, 2010), https://www.justice.gov/atr/case/us-et-al-v-ticketmaster-entertainment-inc-et-al.

[6] "*The regulatory component of antitrust intervention is even more pronounced when looking at merger remedies."* (Motta, Polo and Vasconcelos, 2007[115])

[7] The settlement of the *Ticketmaster/Live Nation* merger included the divestment of certain ticketing assets, a licensing agreement and anti-retaliation provisions, creating hence a hybrid remedy package.

U.S., et al. v. Ticketmaster Entertainment, Inc., et al., Case: 1:10-cv-00139, (DDC, 2010), https://www.justice.gov/atr/case/us-et-al-v-ticketmaster-entertainment-inc-et-al.

Chapter 6. Concluding remarks

It is now generally recognised that merger control should look at the competitive effects of mergers beyond the very short term, considering how a transaction is likely to affect market outcomes in a foreseeable time horizon. While static effects on prices and quality remain a central component of a merger assessment, dynamic effects on innovation and investment can be even more important for consumers in the long-term, therefore deserving proper consideration. What exactly constitutes an ideal timeframe of analysis is nevertheless still an open question, as the assessment of far-reaching effects in the distant future also poses the risk of raising the subjectivity of merger enforcement and may lead to greater legal uncertainty.

There are several practical measures that competition authorities can implement to assess the dynamic effects of mergers, requiring little to no departure from traditional merger tools. Among other things, authorities can analyse the substitutability of innovation resources, look at the evolution of market shares, assess barriers to entry and exit in a market, adapt price pressure tests to quantify innovation effects, consider dynamic efficiencies associated to innovation spillovers, design structural remedies conditional on future market events and introduce review clauses in behavioural remedies. As the interest in the long-term effects of mergers grows, it is likely that academics and practitioners will keep developing refined assessment tools to help improving the precision of merger enforcement.

At this point, it is largely unclear whether the traditional merger review process, which is predominantly based on the analysis of static effects, has systematically led to an under or over enforcement against horizontal mergers. Despite the growing number of empirical studies conducting ex-post assessments of merger enforcement decisions, it is still difficult to withdraw conclusions in either direction, because the vast majority of the studies tend to focus their analysis on price effects observed during the immediate period after the merger. Future research involving a more sophisticated analysis of dynamic effects during a longer time period would hence provide valuable information to competition authorities and help them tuning their future enforcement decisions.

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