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Non-price Effects of Mergers and Acquisitions

Justus Haucap & Joel Stiebale[*]

July 2023

Abstract

In this paper, we summarize the economic literature on non-price effects of mergers and acquisitions (M&As). Specifically, we discuss the effects of M&As on innovation, product variety, and sustainability. Although the relationship is theoretically ambiguous, the vast majority of ex-post evaluations of horizontal M&As finds large negative effects on innovation inputs and outputs. Results are mixed for outcomes related to variety and product quality. Literature on merger effects on sustainability is still scarce and not conclusive so far. Overall, the existing literature indicates that non-price effects of horizontal mergers seem to amplify negative consequences for consumers from price increases through reduced competition. We derive a number of ideas and options for merger policy.

JEL Codes: L10, L11, L13, L19

Keywords: Merger, Competition Policy, Innovation, R&D, Product Variety, Sustainability

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1 Introduction

Following recent merger cases in high-tech industries, competition authorities have become increasingly concerned about the effects of mergers on innovation and other non-price outcomes such as product variety, quality, sustainability and labour market outcomes.[1] While tools to predict price effects of mergers are quite well developed, predicting effects on non-price strategies is much more challenging (see OECD, 2018), as the relationship between mergers, innovation and other outcomes is ambiguous from a theoretical point of view.

In this paper, we summarize the theoretical and empirical literature on non-price effects of mergers and acquisitions. Although the relationship is theoretically ambiguous, the vast majority of ex-post evaluations of horizontal mergers has found statistically significant and economically substantial negative effects on innovation inputs and outputs. On average, negative effects seem to be most pronounced in research and development (R&D) intensive industries, when pre-merger market concentration is high and when there is high technological proximity between acquirer and target. We also discuss the acquisition of potential competitors which can lead to "killer acquisitions", where a firm is acquired with the aim to terminate existing projects. We discuss challenges related to how mergers that harm innovation can be identified ex ante by competition authorities and derive a number of ideas and recommendations for merger policy related to measurement and possible remedies. We also discuss a number of selected past merger cases.

Next, we turn to other non-price outcomes such as product variety, quality and repositioning. Results of the theoretical and empirical literature are mixed for these outcomes. However, overall, the existing literature indicates that these non-price effects of horizontal mergers often amplify negative consequences for consumers from price increases. We also briefly discuss non-price effects of vertical mergers where the evidence is somewhat more positive than for horizontal mergers. Finally, we also discuss the nascent strands of literatures that deal with the effects of mergers on monopsony power, wages and sustainability.

The rest of this paper is organized as follows. Section 2 reviews the literature on the effects of horizontal mergers on innovation and the acquisition of potential competitors and derives recommendations for merger policy. In section 3, we discuss effects on other non-price outcomes such as product variety, repositioning, and product quality. Sections 4 and 5 are devoted to effects on sustainability and labour market outcomes. Section 6 concludes.

[1] Examples of relevant cases in which such concerns have been raised include Pfizer/Hospira, GlaxoSmithkline/ Novartis and Dow/DuPont. An early overview of merger effects on innovation, product quality and consumer privacy has been provided by the OECD (2018).

2 Mergers and innovation

2.1 Horizontal mergers and innovation

Horizontal mergers usually lead to a decrease in product market competition. To understand the mechanism of how mergers affect innovation, it is useful to first review the relationship between competition and innovation more generally. This relationship has been discussed ever since Schumpeter (1942) developed the by-now famous concept of creative destruction.

One key difference between the analysis of the effects of static competition on both prices and quantities on the one and the effects of competition on innovation on the other hand is the lack of a reliable pattern of predictions with respect to innovation. As a rule of thumb and a useful heuristic, a reduction in the number of firms (and, thereby, an increase in concentration levels) tends to lead to an increase in prices and a reduction in consumer surplus and overall welfare. Of course, there is also a general presumption that mergers below certain turnover and concentration thresholds are likely to be efficiency enhancing so they are not subject to any in-depth investigation if they have to be notified at all. In addition, for a prohibition of a merger the threshold is not that the merger leads to any kind of impediment of effective competition, but to a substantial one. If the impediment of effective competition is not substantial the general presumption enshrined in law is that the merger is likely to be efficiency enhancing. And, finally, even mergers that are likely to lead to a significant impediment of effective competition, will not be prohibited if firms can demonstrate so substantial efficiencies that they outweigh the likely anticompetitive effects of the merger. In concentrated markets, however, the general rule of thumb is that a further increase in concentration tends to lead to higher prices.

In contrast, the relationship between concentration levels and innovation is far less clear and much more ambiguous. Effectively, innovation incentives may, generally speaking, either increase or decrease with an increase in market concentration. The reason for the ambiguous relationship between market concentration and innovation are the various countervailing effects at work. First of all, as has been pointed out more than 60 years ago by Arrow (1962), the replacement effect (sometimes also called profit effect) implies that firms with high market shares (in concentrated markets) have lower incentives to invent new products (or processes) as these products replace the firm's own products to a large extent. Put differently, if firms enjoy already high profit levels due to soft market competition the additional profit from innovative products or process improvements is relatively small, at least when compared to firms with low profit levels and low market shares (in less concentrated markets), as the latter have more to gain from innovation. However, as has been shown, the replacement effect does not need to hold once products are sufficiently differentiated.[2]

[2] See, e.g., Greenstein and Ramey (1998) and Gilbert (2006).

More fundamentally though, the effect may be completely reversed once the relevant counterfactual is changed. While Arrow compared a firm's profits with and without a given innovation to derive the firm's innovation incentives, Gilbert and Newberry (1982) have argued that the relevant counterfactual may rather be the competitive threat of a competitor adopting the innovation. Hence, the relevant comparison to derive a firm's innovation incentives would be the firm's profit with innovation compared to the firm's profit when a competitor first adopts the innovation. This comparison appears to be especially relevant for patentable innovations. As firms with high market shares and high profit levels (in concentrated markets) have more to lose, innovation incentives are higher for them than for firms in more competitive markets which enjoy lower profit levels.

Quite generally, starting with Dasgupta and Stiglitz (1980), the industrial organization literature has often modeled innovation as an outcome of investment in R&D that increases markups through a reduction in marginal costs (process innovation) or an outward shift in demand (product innovation). A large number of studies have analyzed how such investments respond to changes in competition.

From a theoretical point of view, there are two countervailing channels. On the one hand, competition reduces profit margins and market shares per firm and thus the returns to investment—the so-called Schumpeterian effect. On the other hand, competition also decreases rents in the absence of investment, inducing firms to invest to "escape competition", as Arrow (1962) argued. In oligopolistic markets, an increase in competition can lead to more investment into innovation, as it increases the sensitivity of demand that a firm faces to enhanced efficiency (Schmutzler, 2013; Vives, 2008). Put differently, the more intense competition a firm faces, the more demand it can "steal" from competitors by a lower price (enabled through reduced costs) or higher product quality. Aghion et al. (2005) were the first to formalize these countervailing mechanisms in a duopoly model, but other researchers have extended their framework to account for different types of market structure (e.g., Bombardini et al., 2018; Gutierrez and Philippon, 2017; Schmutzler, 2013; Vives, 2008).[3]

Due to the countervailing mechanisms, this literature generally provides ambiguous predictions on the relationship between competition and innovation incentives. However, they also predict that positive effects due to the escape-competition mechanism are more likely for technological leaders than for laggard firms. Another prediction of these class of models is that non-linear relationships between competition and innovation might arise. For instance, in Aghion et al. (2005), the relationship tends to be inverted U-shaped. However, depending on the market

[3] For an overview of the theoretical literature see Schmutzler (2013) and Vives (2008).

structure, a U-shaped relationship (e.g., Schmutzler, 2013) or a plateau-shaped relationship (Igami and Uetake, 2020) can arise as well.

Empirical evidence on the competition-innovation relationship seems to be less ambiguous. Although results are mixed, the majority of studies has found that competition tends to spur innovation (see the overview of related literature in Shu and Steinwender, 2019).[4] Many of these studies use exogenous variation brought by trade liberalization or deregulation events.

One mechanism through which mergers can affect innovation is therefore through a decrease in product market competition. This decrease in competition is, however, asymmetric among insiders and outsiders of a merger, since the merged entity internalizes part of the business-stealing effects of innovative activity (e.g., Valletti and Zenger, 2021). It is therefore, a priori, not obvious that a merger affects R&D investment of merging firms and their rivals in the same direction.

Several additional channels potentially affect the relationship between innovation incentives and mergers. First, a merger might change the ability to appropriate returns to innovation, e.g., due to a smaller market share of potential imitators, improved opportunities to use patents or license technologies (e.g., Gilbert and Greene, 2014). Since spillovers lead to underinvestment, their internalization through mergers tends to spur innovation. Second, mergers can affect competition in technology markets, i.e., before R&D is turned into commercial innovations, for instance in a patent race (e.g., Dasgupta and Stiglitz, 1980; Marshall and Parra, 2019). Third, there are potential efficiency gains from mergers in the context of innovation activities which include complementarity in research outputs, know-how, and patents and a reduction of duplicate research effort (e.g., Bertrand et al., 2012). Finally, M&As can provide market access through distribution channels and trade networks (e.g., Blonigen et al., 2014; Guadalupe et al., 2012) or market-specific knowledge such as marketing expertise (Nocke and Yeaple, 2007) that are only possessed by one of the merging parties. Improved market access via M&A can induce innovation since fixed costs of R&D activities can then be spread over a larger production output post-acquisition (e.g., Guadalupe et al., 2012).

Motta and Tarantino (2021) analyze a model of mergers among firms that play an aggregative game in differentiated goods. In their model, mergers lead to less innovation of merging entities since their overall market share declines, but increases innovation of outsiders as they capture additional market share to which cost-reducing innovations can be applied. However, overall industry-level investment declines when there are no efficiency gains. These results hold for some demand systems, most of which are characterized by the so-called independence of

[4] However, there are also a few exceptions, mainly US case studies, that provide evidence of a negative relationship (e.g., Autor et al., 2020).

irrelevant alternatives (IIA) property like Logit and CES demand. Bourreau et al. (2021) develop a theoretical model to study how horizontal mergers to monopoly affect incentives to invest into demand-enhancing innovations. The authors find that the overall impact of a merger on innovation can be either positive or negative. Federico et al. (2017, 2018) and Denicolo and Polo (2018) analyze the effects of mergers on product innovation in a patent-race-like setting in which R&D investment affects the probability of success but not on the value of an innovation. Depending on the assumption of how R&D expenditure is spread across the merging firms, horizontal mergers can spur or reduce innovation. Bourreau et al. (2021) show that given demand-enhancing innovation in an industry with symmetric firms before the merger, most demand specifications considered by Federico et al. (2018) and Motta and Tarantino (2021) can only lead to less innovation activity as a result of the merger.[5]

Marshall and Parra (2019) develop a dynamic patent race model with a technology leader and a number of followers.[6] In this model, competition is reflected in the number of firms competing in the product market and in the number of research labs which compete in the market for technology, but not in the product market. The authors find that a reduction in the number of research labs (e.g., through a merger) always decreases innovation in the industry, although it increases investment per firm. The direction of the relationship between product market competition and innovation depends on the nature of competition and can lead to non-monotonous relationships. The net effect depends on whether the profit gap between leaders and followers is increasing or decreasing in the number of firms.[7] If the profit gap is increasing, R&D also increases with the number of firms. If the profit gap decreases, R&D increases in the number of firms if there are sufficiently many research labs. Overall, the relationship between competition and innovation in this model depends on the product market game and parametrization and may be monotonic or inverted U-shaped. Although there is no monotonicity, a merger in a concentrated (few firms) industry is usually associated with less innovation. Reductions in competition in the market for technology always decrease R&D.

Igami and Uetake (2020) set up a dynamic structural model which builds on the insights from Marshall and Parra (2019). They estimate this model using data from the hard disk drive industry which has been characterized by substantial entry, exit and consolidation between 1996 and 2016. Specifically, the authors use data on R&D, market shares, HDD price, disk price and quantities sold to estimate demand and infer variable costs. They find that innovation incentives increase substantially in the number of competitors for a small initial number of firms.

[5] See also the overview of related literature in Jullien and Lefouili (2018).
[6] The model builds on a framework developed in Mermelstein et al. (2020).
[7] Examples where the profit gap increases with the number of firms include price competition with a homogenous good and process innovations as well as price competition with logit demand and quality-enhancing innovations. For Cournot competition, the relationship depends on the parametrization of the model.

The relationship becomes plateau-shaped for a large number of firms but a reduction in the number of competitors never has a positive impact on innovation.

Igami and Uetake (2020) also ask how far an industry should be allowed to consolidate when competition and innovation are endogenous. Based on counterfactual simulations, the authors conclude that their "counterfactual simulations suggest the current rule-of-thumb policy, which stops mergers when three or fewer firms exist, strikes approximately the right balance between pro-competitive effects and value-destruction side effects in this dynamic welfare tradeoff." We agree that a merger from three to two firms is likely to lead to too much market concentration. However, in many industries, competition authorities should probably be concerned even when there are more than three firms in the markets, especially when firms are heterogeneous and relatively large firms are involved in the merger.

Bennato et al. (2021) conduct ex-post-merger evaluations using data on the hard disk drive industry. They find an increase in innovation after a consolidation from five to three firms. The authors estimate positive effects for various innovation indicators such as R&D spending, patents and new products for some firms but mixed evidence for other firms involved in mergers.

Haucap et al. (2019) analyze the effects of mergers on incentives to invest in quality-improving (demand-enhancing) innovations for the merged entity and a non-merging rival firm. They analyze a Bertrand model with differentiated goods as well as a patent race model.[8] They show that in both classes of models, the effects of mergers depend on the research intensity of an industry (determined by the ratio of fixed costs of R&D relative to its returns) and the degree of firm heterogeneity (measured as ex ante efficiency differences between acquirer and target firm). There are two opposing channels which drive the overall effect. On the one hand, as competition increases, the business stealing effect ─ i.e., the effect of innovation on equilibrium demand ─ becomes smaller which reduces innovation incentives. On the other hand, output per (newly combined) firm may increase post-merger ─ and hence the benefits from higher markups due to innovation can be spread over more units of output ─which increases the returns to R&D. Which effect dominates depend on an industries' R&D intensity, the degree of firm heterogeneity and product substitutability. Negative effects on innovation are more likely in a research-intensive industry and when product substitutability is high, which increases the importance of the business stealing effect. The degree of firm heterogeneity, i.e., pre-merger efficiency differences between and acquirer and target, has asymmetric effects on innovation efforts of merging firms and their rivals. For merging firms, positive effects are more likely when firm heterogeneity is high, as the combined firm benefits from the removal of inefficiencies. For

[8] An earlier version of this paper has used a Cournot model with heterogeneous firms which yields similar conclusions.

non-merging rivals, positive effects are less likely when acquirer-target heterogeneity is high. The reason is that when a relatively inefficient firm is taken over, the increase in market share for the outside firm to which it can apply increased markups is relatively small.

Haucap et al. (2019) test the predictions of their theoretical model using data on European mergers and patent applications for the pharmaceutical industry. The publicly available merger reports of the EC allows defining the relevant markets and firms affected by mergers. They use a propensity score matching approach in combination with a difference-in-differences (DiD) estimator to analyze patenting of merging firms and non-merging rivals before and after a merger relative to a control group of similar firms which have not been affected by mergers. The authors estimate effects at the level of the firm and at the technology field (IPC class) level. Consistent with the predictions for a research-intensive industry, they find, on average, large negative average effects of mergers on innovation of merging firms and their rivals. These amount to a reduction in patenting within four years after a merger of more than 40% and 25% for merging firms and their competitors, respectively. The average decline is driven by technology fields in which acquirer and target (acquirer, target and rival for the case of outsiders) have both patented in pre-merger periods. As predicted by theory, negative effects of mergers on innovation are also more likely when an industries' innovation intensity is high.

Antitrust authorities have to base the decision which merger to approve on ex ante evaluations. The results of Haucap et al. (2019) indicate that the degree of pre-merger overlap is a good predictor for post-merger reductions in innovation activity. Further, the risk of reductions in innovation is more likely the higher the degree of R&D intensity of an industry. Heterogeneity in R&D efficiency of acquirer and target makes reductions in innovative effort at the industry level more likely when the pre-merger market shares of insiders is small, but less likely when acquirer and target have large market shares pre-merger.

Ornaghi (2009) also finds large negative effects of pharmaceutical mergers on innovation activities of merging pharmaceutical companies. They estimate an average reduction in patenting of more than 25% and a decrease in R&D expenditures of about 6%. These effects are concentrated in cases where there is overlap in technology classes. In contrast, a large product market overlap reduces the negative effects on R&D and patenting. The result of negative effects of technology overlap is consistent with Haucap et al. (2019). The substantial negative average effects estimated for the pharmaceutical industry in both studies indicate that merger policy has been somewhat too lenient in the past.[9]

In a very recent (not yet published) paper, Morzenti (2022) studies how mergers affect innovations of merging firms across all US industries. Morzenti (2022) uses a change in US

[9] Grabowski and Kyle (2008) estimate positive long-run effects of pharmaceutical acquisitions. The effects stem, however, from relatively small firms which do typically not raise anti-competitive concerns.

merger notification thresholds in 2000 that made hundreds of smaller mergers exempt from notification and compares mergers notified to the authorities with non-notified ones. He uses a text analysis methodology to identify mergers between close competitors, even for small private firms which is trained on the corpus of US published patents. His definition of competitors is based on similarity of patent abstracts and therefore identifies firm-pairs that produce similar technologies rather than those that currently compete on product markets. He finds that non-notified mergers lead to 30% less innovation effort, measured as patenting activity. To understand the mechanism driving these findings, Morzenti (2022) builds a model with endogenous merger choice where optimal antitrust policy deters anticompetitive mergers, which are also most detrimental to innovation.

In contrast, Bena and Li (2014) find positive effects of mergers on innovation across a broad set of industries which are higher when there is technological overlap between acquirers and targets. Similarly, Entezarkheir and Moshiri (2018) investigate merger impacts on innovation using a panel data consisting of four different data sets on publicly traded US manufacturing firms from 1980 to 2003. They use citation-weighted patens as a proxy for innovation and aim to address endogeneity concerns using instrumental variables based on firms' previous merger activities. Their analysis finds that mergers are positively and significantly correlated with firms' innovation and also indicates that effects on innovation are heterogeneous across industries, increase with market share, and are greater in the long run. It is important to note, however, that Entezarkheir and Moshiri (2018) cannot distinguish between horizontal, vertical and conglomerate mergers in their analysis.

Guadalupe et al. (2012) estimate positive effects of cross-border acquisitions on technology adoption of target firms. Stiebale (2016) finds positive effects of cross-border M&As on innovation in the combined entity as a whole (although asymmetrically distributed among acquirer and target) but negative effects after domestic M&As. However, these studies do not explicitly focus on horizontal mergers either, but the estimation samples include a large number of cross-industry transactions. It is, therefore, likely that non-competitive effects prevail such as access to new markets (which is arguably more important for cross-border M&A) and synergies (which can for instance arise from complementary technologies). In contrast, Szücs (2014) analyzes a sample of horizontal mergers which have been under scrutiny by the European commission and finds that acquiring and target firms reduce R&D investment post acquisition. The effects are more pronounced for target firms which reduce their investment between 7% and 10% per year.

Moraga-Gonzalez et al. (2022) find that mergers cannot only change the volume but also the direction of innovation in firms investing in multiple research projects of different profitability and social value. In their model, R&D has both a business-stealing and a business-giving

externality for rival firms and these externalities are internalized after a merger. When a project that is relatively more profitable also appropriates a larger share of social surplus, a merger reduces investment in the more profitable projects and increases investment in the alternative project. However, the opposite result emerges if the more profitable project appropriates a lower share of social surplus.

Bryan et al. (2022) analyze the relationship between R&D competition and the direction of innovation. They argue that a more competitive R&D supply side induces firms to shift innovation efforts towards less promising but quicker-to-invent projects. The authors confirm their hypothesis using data on pharmaceutical innovations during the Covid-19 pandemic.

All in all, although results are neither theoretically nor empirically robust, it seems like, on average, mergers tend to reduce innovation in the relevant market. This is particularly the case in highly concentrated and R&D intensive industries which are most relevant for competition policy. Evidence also indicates that one should be specifically concerned when mergers tend to reduce competition in technology markets which is particularly likely in the case of high pre-merger technological proximity. Mergers may change market power in technology markets beyond a reduction in the number of firms. If acquirer and target are active in related technological fields, they can pool their existing patents or file new patents to prevent other firms from developing competing technologies (e.g., Cassiman et al., 2005; Grimpe and Hussinger, 2008). Markets for technology also play an important role in the discussion on "killer acquisitions" to which we turn in section 2.6. We are not aware of ex-post- evaluations that analyzes effects of horizontal mergers on the degree of novelty of innovation activities.

2.2 Vertical mergers and innovation

In contrast to the evidence on horizontal mergers, vertical integration is likely to have more positive effects on investment and innovation. Channels through which investment and innovation can increase after a merger include an internalization of spillovers and a reduction of holdup risks, e.g., when a firm that holds essential patents is acquired (e.g., Salop, 2018).[10] For instance, Ciliberto (2006) estimates positive effect of vertical consolidation in the provision of health care services on investment. Slade (2021) surveys the empirical literature on the effects of vertical integration on various outcomes and Lee et al. (2021) provide a discussion of structural models of vertical relations. A survey with a focus on the theoretical literature is provided by Asker and Nocke (2021).[11]

[10] Essential patents can, however, also raise concerns about foreclosure as an acquirer of such patents has incentives to restrict licensing to its rivals.
[11] See Lafontaine and Slade (2007) and Rey and Tirole (2007) for a survey of the earlier empirical and theoretical literature, respectively.

Zhang and Tong (2021) classify vertical M&As across many US industries based on input-output tables. They find that vertical integration leads to more innovation, measured by patent counts and citation-weighted patents. They also find that the direction of innovation changes after vertical integration as firms produce more complex innovations with higher scope but reduce the amount of less complex innovations. A potential concern with cross-industry studies in this context is a rather crude measure of vertical integration. As shown by Atalay et al. (2014), vertical ownership is often unrelated to physical input flows. A comprehensive study of how vertical integration between buyers and suppliers affect innovation and other non-price outcomes across a large number of industries is, to our knowledge, still missing.

2.3 European Commission cases

In this section, we discuss a few merger cases in which innovation activities have played an important role in European Commission decisions.

In the *Intel/Mc Afee* merger (2011), a key competition concern was that, after the merger, Intel would have the ability and incentive to hamper so-called endpoint security solutions that competed with McAfee's from running on Intel's dominant central processing units (CPUs) and chipsets. Such foreclosure would likely have resulted in negative effects for rivals to innovate in this market and a significant weakening and possible exit of McAfee's main competitors within two to five years, according to the Commission. The accepted remedy ensured that Intel could not block other security software providers from operating on its chips and from bringing innovative competing solutions to the market. McAfee's competitors are guaranteed access to all necessary Intel technical information. Intel committed not to actively impede competitors' security solutions from running on its chips. This was combined with an effective monitoring system and a fast-track arbitration mechanism in case of disputes.

The *Medtronic/Covidien merger* (conditionally approved in 2014) involved two medical device companies with Medtronic being the leader on the market for drug-coated balloons to treat vascular diseases. There were few competitors active in that market. The target company Covidien had a promising late-stage pipeline product, a drug-coated balloon called Stellarex. The European Commission found that Covidien would have constrained Medtronic in the near future, in view of the promising clinical trial results of Stellarex. Without proper remedies, the merger would have eliminated a credible competitor and would – according to the Commission – likely have reduced innovation in this area. In order to address these concerns, Medtronic committed to selling Covidien's worldwide Stellarex business, including in particular manufacturing equipment, related IPRs and scientific and regulatory material necessary to complete the Stellarex trials, and key personnel.

The European Commission raised concerns when *Novartis* acquired *GlaxoSmithKline's* (GSK) oncology business related to both late-stage (phase III) and earlier stage (phases I and II) pipelines in connection with similar drugs. The Commission identified the risk that Novartis would likely have stopped developing two innovative drugs that showed great promise for the treatment of skin and ovarian cancer (for which late-stage clinical trials were being conducted) and that were also tested for treating several other cancer types (for which early-stage clinical trials were ongoing), as GSK already had drugs with the same mechanisms in its portfolio. As the merger would have led to a duopoly between the merged entity and Roche for these specific skin and ovarian cancer treatments, the Commission argued that the merger would likely have reduced innovation in the area and that Novartis would likely abandon its early-stage clinical trial programme of the two drugs. The Commission approved the merger on condition that Novartis would fully divest the drugs.

In the *Pfizer/Hospira* case (conditionally approved in 2015), one of the European Commission's main concerns related to a specific biosimilar drug for treating autoimmune diseases. At the time of the investigation, only one such biosimilar was on the market, which had been developed by Celltrion and which was co-marketed independently and under competing brands by Hospira and Celltrion. Pfizer was at an advanced stage of development of a competing biosimilar, as was Samsung Bioepis. The Commission argued that, following the merger, one of two scenarios would likely have materialised: Either Pfizer would have delayed or discontinued development of the biosimilar drug to focus on Hospira's product, or Pfizer would have handed back Hospira's product to Celltrion, leading to the loss of current price competition between the two companies. The remedy accepted by the Commission was the full divestment of Pfizer's biosimilar drug currently under development (including global development and manufacturing rights as well as appropriate IPRs).

The *General Electric/Alstom* merger (also conditionally approved in 2015) concerned gas turbines used to generate electricity and would have eliminated one of the four full-technology companies that are able to produce large and very large gas turbines worldwide. The Commission argued that General Electric would likely have discontinued some of Alstom's products (including an existing turbine called GT26 and a pipeline product called GT36), closed the innovation pools developed by Alstom and, apart from direct unilateral effects, also reduce the competitive pressure on the market's number two, Siemens. The Commission cleared the transaction subject to the divestment of the technology for the GT26 and GT36 turbines, a significant share of Alstom's long-term servicing agreements for GT26 turbines, two test facilities for these turbines as well as a large number of Alstom R&D engineers

The European Commission prohibited the proposed acquisition of *O2 UK by Hutchison 3G UK* (2016) not only because of concerns about price and consumer choice but also because of

potential harm to innovation. As stated by Commissioner Vestager: “We had strong concerns that consumers would have had less choice finding a mobile package that suits their needs and paid more than without the deal. It would also have hampered innovation and the development of network infrastructure in the UK, which is a serious concern especially for fast moving markets.”[12]

In March 2017, the European Commission approved the merger between US-based chemical companies *Dow* and *DuPont*, conditional in particular on the divestiture of major parts of DuPont's global pesticide business, including its global R&D organisation. According to the Commission’s analysis, without commitments the merger would have reduced innovation, both to improve existing products and to develop new active ingredients in the pest control industry. The Commission's investigation of Dow and DuPont's innovation pipelines concluded that the two firms were competing head-to-head in a number of important herbicide, insecticide and fungicide innovation areas. After the merger, they would have an incentive to discontinue some of these costly development efforts. The Commission also concluded that the merged entity would have lower incentives and a lower ability to innovate than Dow and DuPont separately and cut back on the amount devoted to developing innovative products. After the merger, only three global integrated players would remain to compete with the merged company, with an even lower number in specific innovation areas.

Dow and DuPont addressed these concerns by divesting the relevant DuPont pesticide businesses and almost the entirety of DuPont's global R&D organisation. Otherwise, the merger would have significantly impacted innovation competition by (a) removing the parties' incentives to continue to pursue ongoing parallel innovation efforts and (b) removing the parties' incentives to develop and bring to market new pesticides.

In contrast to the *Dow/Dupont* merger, the European Commission did not find that competition for innovation in pesticides would be negatively affected by the merger of *ChemChina* and *Syngenta* since ChemChina did not compete with Syngenta for the development of new and innovative pesticides, as ChemChina did not carry out R&D activities to discover new active ingredients.

In March 2018, the European Commission approved the acquisition of *Monsanto* by *Bayer*, conditional on the divestiture of an extensive remedy package. In its analysis, the Commission employed a comparable approach as in the *Dow/DuPont* case, using patent data to identify the technological strengths of the two firms in several innovation and potential innovation-related effects of the merger by looking at joint patent shares. Bayer submitted the following commitments to address the competition concerns: (1) Removing all of the parties' existing

[12] https://ec.europa.eu/commission/presscorner/detail/pt/IP_16_1704

overlaps in seed and pesticide markets, where concerns were raised, by divesting the relevant Bayer businesses and assets. (2) Divesting Bayer's global R&D organisation for seeds and traits as well as Bayer's research activities to develop a challenger product to Monsanto's glyphosate, including certain Monsanto assets, which in the future would have competed with a Bayer seed treatment against nematode worms. (3) Granting a license to its entire global digital agriculture product portfolio and pipeline products to ensure continued competition on this emerging market.

In December 2020, the acquisition of Fitbit by Google was approved by the European Commission, subject to compliance with several commitments offered by Google. As the merger concerned only very limited horizontal overlaps between the Google and Fitbit, the investigation focused on the data collected via Fitbit's wearable devices and the interoperability of wearable devices with Google's Android operating system for smartphones. The commitments include several data access and interoperability provisions for a period of ten years.

In January 2022, the European Commission cleared acquisition of *Kustomer by Meta* (formerly known as Facebook), following an in-depth phase-II investigation. Kustomer is a small, but innovative and fast growing provider of customer relationship management (‘CRM') software. CRM software applications are used by businesses for engaging with their customers to manage various communication channels through which consumers contact the businesses such as WhatsApp, Instagram and Messenger of Meta, but also other messenger services, SMS, email etc. Hence, the acquisition of Kustomer by Meta can be considered a vertical merger.

The Commission's investigation mainly focused on whether Meta would have incentives to foreclose the CRM software market by disadvantaging other CRM software providers, e.g., by denying or degrading access to the application programming interfaces ('APIs') for Meta's messaging channels, i.e., WhatsApp, Instagram and the Facebook Messenger. As the Commission noted, providers in this market “are particular drivers of innovation. Such foreclosure strategies could reduce competition in the market for the supply of CRM software and the market for the supply of customer service and support CRM software, leading to higher prices, lower quality and less innovation”.

As a consequence, Meta offered two access commitments for a 10-year period following the merger, namely, (1) a public API access commitment that guarantees non-discriminatory access without charge to Meta’s publicly available APIs for its messaging channels to competing customer service CRM software providers and new entrants, and (2) a so-called core API access-parity commitment by Meta to make all improvements of Messenger,

Instagram messaging or WhatsApp that are used by Kustomer's customers today also available to Kustomer's rivals and new entrants.

2.4 Ex ante measurement and identification of mergers likely to harm innovation

As discussed in section 2.1, there is increasing, and in our view compelling, evidence that mergers not only *can* reduce innovation efforts to the detriment of society, but also that this has happened too often in the past. Even though the general relationship between market concentration and innovation is ambiguous from a theoretical point of view, the majority of the available evidence suggests that, at least in the past, merger policy may have been not sufficiently strict so that a number of mergers have lowered innovation activities, especially in highly concentrated markets and in R&D-intensive industries. By and large, there are three innovation theories of harm that have been applied in the past.

1. Firstly, the merging parties may – without the merger – exert a significant constraint on each other in a future market, and this constraint is removed when the two parties merge.
2. Secondly, competition may be reduced when one of the products of the merging parties may not be developed as a result of the merger.
3. And thirdly, vertical mergers may involve foreclosure scenarios that hinder innovation by third parties, e.g., when a competitor would likely lose access to a product of the merged entity that is needed for it to innovate (e.g., standard essential patents).

While for non-horizontal mergers the evidence suggests that effects are often neutral or positive, there are good reasons to proceed with a rebuttable presumption from now on that horizontal mergers in concentrated markets negatively affect innovation incentives.

It is true that is inherently difficult and uncertain to predict how competition between firms may develop in future markets. At the same time, the negative welfare consequences of a loss of innovation may often even exceed the negative welfare costs of price increases. Intuitively, while a price that exceeds the competitive level typically implies a loss of consumer welfare resulting from a reduction in quantities traded, resulting in the typical welfare loss illustrated by the so-called Harberger triangle, the loss of innovation implies significant infra-marginal losses that are illustrated by shifting supply and/or demand curves. Therefore, there are good economic arguments for an approach that treats mergers which may negatively affect innovation more cautiously and more rigorously than mergers in industries with low R&D and innovation rates.

How can competition authorities assess the potential for negative consequences of mergers on innovation ex ante? Unfortunately, due to the complex nature of innovation and its

relationship with other variables, it is unlikely that there is a single suitable metric such as (the expected changes in) the Herfindahl Index that is often used to assess potential effects on prices (e.g., Nocke and Whinston, 2022). Since existing empirical evidence indicates that negative consequences on innovation are more likely when the initial level of competition is low, information on pre-merger markups and product market concentration, should, of course, be taken into account. However, existing evidence suggests that a reduction of competition in technology markets can be more detrimental to innovation than a reduction in product market competition. In the following, we propose some potential sources of information that competition agencies may utilize to evaluate likely innovation effects of mergers.

Research pipelines

To identify potential innovation effects of mergers, competition authorities should continue to investigate research pipelines in early research stages as well as patents. Such an approach appears to be particularly promising for industries with long research pipelines where the R&D process takes a long time. Good examples are the pharmaceutical and the agrochemical industries. For this purpose, competition authorities can analyse concentration of R&D expenditures in the relevant industry, ideally broken down into relevant business segments, product markets or geographical markets. In few cases such as the pharmaceutical industry, such data is publicly available due to regulation. When such data is not publicly available, it could be directly requested from the merging parties and their competitors. In those industries where patents are most important as an appropriation mechanism, these can also provide a lot of valuable information.[13] The existing literature has used technology classes of patents and backward citations to construct measures of technological proximity between firms. For instance, a classic measure of technological proximity has been developed by Jaffe (1986) and is based on the uncentered correlation coefficient (cosine similarity) between the vectors of two firms' shares of patents across technology classes. More recent approaches take similarities across technological fields into account using shared citations, co-appearances of technological classes within patents and inventors (Yan and Luo, 2017) or directly measure similarity of patents using text-based measures (e.g., Arts et al., 2018). Since empirical evidence suggests that high values of these measures are associated with higher reductions in post-merger innovation activities (e.g., Haucap et al., 2019; Morzenti, 2022), patent-based measures of technological proximity can provide an indication of potentially problematic pre-merger overlap.[14] For patents filed with the European patent office, it is also possible to identify

[13] Estimates of the importance of patents across industries can, for instance, be found in Cohen et al. (2000) and Arundel and Kabla (1998).
[14] In a few cases, technological proximity can also indicate potential for complementarity in patents. Hence, such measures should always be combined with industry-specific expertise on the nature of innovation.

citations that define the state of technology and citations that threaten the novelty of citing patents and those that threaten novelty in combination with other patents. Such information can be suggestive for the risk that a merger will lead to blocking of future innovations by competitors (e.g., Grimpe and Hussinger, 2008).

In contrast, in many other industries including most digital markets, research is often not patented and often does not involve long time horizons. For these markets, alternative approaches are necessary to predict (potential) future competition.

Expert interviews

In addition, information about expected research activities may be gained through expert interviews with (a) competing firms, (b) firms that supply inputs or purchase outputs from the merging firms and (c) independent experts such as industry observers, venture capitalists, or scientists relevant for a particular field. While expert views may be biased, especially from competing firms which may even act strategically in answering information requests, conducting interviews with experts with various backgrounds (competitors, suppliers, buyers, independent) may still provide useful information and may be used as evidence for likely or less likely innovation paths.

Transaction value

Almost obviously, transaction values may reveal information about a firm's potential to compete and to innovate. Even if no transaction value threshold is introduced in European merger control (in contrast to some member states), the transaction value can still provide very useful information about the market's perspective about a firm's potential. In more detail, if a firm's valuation is particularly high in relation to its sales and/or profits, this may suggest that the firm's value may rather result from its innovation capabilities.

Recruitment strategies

Furthermore, firms' recruitment strategies may in some cases implicitly reveal information about their innovation strategies. If, for example, firms hire engineers or scientists with a particular expertise, this may point towards a firm's R&D direction or strategy. Admittedly, the examination of firms' recruitment strategies may only provide limited insights in many cases, but in some cases useful information may be revealed through job advertisements.

Total consumer time

In digital media markets, consumers' use of time may also reveal whether firms may potentially compete. While, for example, social networks (such as Facebook) and streaming platforms (such as Youtube) have typically not been regarded as competitors, they may compete for consumers' time, which is important for generating advertising revenues. At the same time, platforms that can attract a substantial fraction of consumers' online time, may be in a position to steer consumers into certain directions, thereby having "steering power". Steering power may possibly be important to facilitate innovations.

Theory of harm

If a well-accepted economic theory exists which suggests that innovation incentives for the merging firms under consideration are reduced or that the firm may have incentives to adopt strategies that prevent competitors from innovating (e.g., various foreclosure strategies, loss of innovation competition, reduction in business stealing through innovation), these incentives should be regarded as sufficient evidence that innovation incentives are likely to be harmed.

There are also cases were negative consequences of mergers on innovation are less likely to occur. For instance, when mergers enable firms to combine complementary technologies or when they provide access to new markets which tends to increase the returns to investment in R&D. Such factors can be taken into account by competition authorities, especially in the case of cross-border transactions.

2.5 Innovation efforts as part of an efficiency defence

According to a 2012 OECD Roundtable report (OECD, 2012), some typical efficiency claims are related to R&D efficiencies. Mergers can raise synergies in labs, bring together complementary research lines and skills, and also avoid the duplication of research.

More recent evidence, gathered by Reinhilde Veugelers (2017), however, suggests that innovation efficiencies only play a minor role in European merger control. According to Veugelers, from a total of 42 EU phase II merger cases between 2004 and 2016 efficiencies were claimed in only 16 cases, of which only 11 claimed dynamic efficiencies gains. In only four cases, innovation was mentioned in the efficiency claims. While in three of these four cases the Commission accepted that the innovation would bring consumer benefits in a timely fashion, only two of the claimed efficiency gains were accepted to be merger specific and in only one single case also to be verifiable so that the dynamic efficiency claim was finally

accepted. In that particular case (Hutchison 3G & Telefonica Ireland), the dynamic efficiency claims were, however, not decisive for the merger case.

Why are dynamic efficiencies related to innovation not claimed more often? As has been argued by Röller (2010), one reason may be that claiming efficiencies may lead to a negative presumption within the Commission about the particular merger's anti-competitive effect. An additional reason, particularly related to innovation efficiencies, may well be that the requirement that efficiencies must benefit consumers in a timely fashion is very difficult to fulfil. According to the European Commission, timeliness is interpreted as a two to four-year timeframe. Interestingly enough, while the claimed efficiencies are expected to materialise in the near future in order to be accepted, the expected harm can also occur in the distant future. As a consequence, a structural imbalance results if efficiencies have to materialise quickly after the merger while potential detriments to competition and innovation can occur in the distant future.

To illustrate this concern: When *Novartis* acquired *GlaxoSmithKline's* (*GSK) oncology business* (also see section 2.3) the European Commission's concerns not only related to late-stage (phase III) pipelines, but also to earlier stage (phases I and II) pipelines in connection with the same drugs. To be more precise, the Commission was concerned that Novartis might have stopped developing two innovative drugs that showed great promise for the treatment of skin and ovarian cancer (for which late-stage clinical trials were being conducted) and that were also tested for treating several other cancer types (for which early-stage clinical trials were ongoing). As GSK already had drugs with the same mechanisms in its portfolio, the merger would have led to a duopoly between the merged entity and Roche for these specific skin and ovarian cancer treatments. Hence, the Commission argued that the merger would likely have reduced innovation in the area and that Novartis would likely abandon its early-stage clinical trial programme of the two drugs. Similarly, the European Commission has argued in its decision regarding the Dow/Du Pont merger that the transaction would be likely to impede competition for innovations, as the merged parties would have reduced incentives to conduct parallel research in cases of overlapping research agendas even for early pipeline products. As a consequence, the Commission imposed strict remedies specifically addressing its concerns with respect to innovation. The result is a structural asymmetry: While the theory of harm is, at least partially, based on concerns that may possibly materialise in the distant future (as very early stage research is concerned which also actually often fails in the end), the efficiencies claimed must materialise within two to four years to be accepted. Hence, the asymmetric shift in the Commission's predictive timeframe may potentially overemphasize potential efficiency losses while underemphasizing potential efficiency gains.

Finally, the condition of verifiability may prove to be even more problematic for demonstrating innovation efficiencies, given the inherently uncertain nature of R&D and innovation.

2.6 Remedies

As outlined above, the European Commission has used a number of remedies such as licensing requirements, structural measures such as the divestment of research labs (including key personnel), testing facilities and even entire production lines, access to technical information and IPRs as well as API access commitments to address its innovation competition concerns.

The effectiveness of these remedies is difficult to evaluate, however, as R&D is inherently uncertain. A potential challenge in the implementation of remedies that involve research labs is that one has to prevent researchers to return to the divesting company without intervening directly into the labour market. This is particularly relevant for some digital markets where intangible assets mainly consist of human capital and not IP rights.

Further remedies, especially in digital markets, may include interoperability requirements and access rights to data. The latter remedy, however, can require a balancing of competition and privacy concerns.

A particular problem may arise if competitors can engage in strategic non-disclosure of their own research, especially in early stages. If a competitor fears that a merger would be procompetitive or if the competitor wishes to acquire IPRs, labs or even personnel from a merging party, that competitor may strategically decide not to disclose its own research agenda in order to have the Commission imposing obligations on the merging parties. Such a non-disclosure strategy will be easier for early stage research than for later stage research and also easier than for sales or production capacities. Hence, there is an increased risk that competitors successfully behave strategically with respect to innovation-related remedies in order to influence the remedy design.

2.7 (Killer) acquisitions of potential competitors

Many mergers involve targets which are potential future competitors even though they are not currently active in the same market as the acquirer. A particular concern is that firms might be acquired to eliminate a project, technology or a whole company (see, e.g., Katz, 2020). Cunningham et al. (2021) analyze the acquisition of potential entrants theoretically and empirically. In their theoretical model, the acquiring incumbent can continue or terminate the entrant's project. As in the classical competition-innovation literature, there is a trade-off

between an efficiency effect and a replacement effect. The entrant often has a higher incentive to innovate because an incumbent has higher pre-innovation profits. However, this difference decreases in the number of firms (i.e., the degree of pre-merger competition). The authors find that killer acquisitions, i.e., those where the entrant's project is terminated, are likely to occur when substitutability between projects is high and when the incumbent's success probability (of developing a new project) is not too high.

Their empirical analysis for the pharmaceutical industry supports these predictions. Specifically, they find that projects where the incumbent firms' therapeutic class overlaps with those of the acquired entrants are more likely to be stopped upon acquisition. They also find that these acquisitions are likely to occur slightly below relevant antitrust thresholds and to a larger extent than non-overlapping transactions. This indicates that acquirers aim to avoid antitrust scrutiny in potential killer acquisitions.

In a yet unpublished paper on R&D and acquisition patterns in the market for antidiabetics, Malek, Newham, Seldeslachts and Veugelers (2022) find that "conversely to the recent narrative of M&A in pharmaceutical markets that portrays large incumbent firms as typical acquirers and small firms as targets, we find that the majority of M&A activity takes place between small and research-focused firms. Further, it is also small and research-focused firms that engage in transactions involving novel or "high risk/high gain" projects." The authors argue that big incumbents with large market shares are less likely to engage in acquisitions rely primarily on in-house R&D.

In a companion paper on the same market (for antidiabetics), Malek, Seldeslachts and Veugelers (2022) find that M&As, on average, increase the likelihood that target projects are being terminated upon acquisition relative to a comparison group of non-acquired projects and reduce the likelihood of post-merger patenting. However, for a subset of transactions, the authors estimate positive effects on innovation. Somewhat surprisingly, these are cases where incumbent firms acquire projects that are based on similar biological process and acquirers and targets' projects are technologically close based on a measure of text-based patent similarity.

Broadening the scope beyond pharmaceuticals, Calvano and Polo (2021) and Argentesi et al. (2021a) discuss the incidence of killer acquisitions and various theories of harm in digital markets. The potential effects of mergers in these markets depend, for instance, on the degree of network effects and multi-homing, loss of competition in the market for attention (i.e., even when products are not direct substitutes, consumers' attention enables firms to exercise market power in online advertising markets), loss of potential competition and loss of innovation.

Fumagali et al. (2021) analyze the acquisition of potential competitors that face financial constraints, which may be common among start-up firms. They argue that acquisitions of potential competitors can be procompetitive if they relax financial constraints in which case the target's product might not be completed in the absence of an acquisition. It is also possible that the prospects of mergers may create ex ante innovation incentives, i.e., start-ups invest in innovative projects with the aim of being taken over. However, these arguments rely on the assumption that there is no outside firm operating in unrelated markets which is willing to take over the financially constrained firm (Motta and Peitz, 2021).

A key challenge for policy makers is that many killer acquisitions occur below the radar of anti-trust scrutiny as they often involve the acquisition of small startup firms with turnovers below the relevant thresholds for merger policy. A potential solution would be to adjust thresholds such that acquisitions of large acquirers are always investigated independent of revenues generated by target firms. This practice has already been partially implemented in digital markets in the European Union, as Article 14 of the Digital Markets Act (DMA) requires gatekeepers to inform the European Commission of any merger in the digital sector, including those involving data collection. This provision could also be extended to other industries where killer acquisitions are likely to be of concern, e.g., the pharmaceutical and the agrochemical industries. An alternative would be to take transaction values rather than turnover into account in generating relevant thresholds for merger scrutiny. Small target firms might generate high transaction values if the expected future value of their innovation is high. Another challenge for policy makers and researchers is that innovation effort and planned entry into product markets is often difficult to observe and measure. This is likely to be especially severe when small start-up firms are being acquired. Competition authorities therefore have to rely on information requested from firms in the relevant market, industry experts, customers and perhaps specialized firms such as venture capital investors.

3 Product variety, quality and repositioning

3.1 Horizontal mergers

Theory predicts that to reduce product market cannibalization, merging firms might drop varieties post-merger due to an internalization of business stealing from competitors (see, for instance Atalay et al., 2020; Mankiw and Whinston, 1986).[15] For the same reason, the merging firms might increase product differentiation among existing brands after a merger (Berry and Waldfogel, 2001; Gandhi et al., 2008). However, merging firms might in principle also make

[15] See Nocke and Schutz (2018) and Gaudin (2021) for an analysis of the general relationship between competition and quality provision.

their products more similar to prevent entry, withdraw duplicated products to reduce costs, or introduce new products that only become profitable through merger-specific efficiency gains (Berry and Waldfogel, 2001).

Berry and Waldfogel (2001) were among the first to study effects of mergers on product variety. They exploit a natural experiment brought by the 1996 Telecommunications Act which lifted ownership restrictions among radio stations and induced a large number of mergers. Their empirical strategy exploits the fact that ownership concentration was allowed to increase more in markets with a higher initial number of radio stations. Their results indicate that mergers in this industry have increased product variety and that merging firms differentiated their programs in a way to reduce entry (see also Sweeting, 2010).

Atalay et al. (2020) analyze the effects of mergers among producers in the consumer-packaged goods industry in the US, focusing on 61 transactions involving the largest 100 conglomerates and their subsidiaries. Their analysis builds on Nielsen retail scanner data for the years 2006-2017. Outcome variables include the number of UPCs as a measure of variety. The empirical analysis is based on a DiD and event study framework. Results indicate that the average merger reduced the number of products offered by around 6% and this effect lasts over several years. Atalay et al. (2020) also provide evidence that the reduction in the number of products offered mostly stems from products with relatively high distance from the merging firms' product portfolio. This indicates that mergers in their sample do not primarily eliminate rival products.

Pires and Trindade (2018) estimates effects of 14 US supermarket merger cases on variety using store-level scanner data from Nielsen. The author uses a DiD strategy comparing affected and non-affected regions. The results indicate an average increase of about 3% in variety in the relevant market, measured by the number of products, following a merger, but this effect is mostly driven by non-merging competitors. The average effect is higher for private labels and is mostly driven by markets with relatively low pre-merger market concentration. In contrast, mergers in highly concentrated markets seem to have reduced variety.

Argentesi et al. (2021b) study the effects of a merger between two Dutch supermarket chains. They compare regions in which the two merging firms competed pre-merger to those regions where they were not competing in a DiD setting. Their results indicate that the target's stores dropped varieties in areas where they competed with the acquirer while acquirers' stores increased variety. Argentesi et al. (2021b) also provide evidence of repositioning. The merging firms in their sample seem to move their portfolio towards higher-priced products resulting in higher average prices in regions with overlap (despite rather constant prices within products due to national retail pricing).

Ashenfelter et al. (2013) show that product variety, measured as the number of distinct products, fell within merging firms after the Maytag-Whirlpool merger, both in absolute terms and relative to non-merging rivals who introduced new products. Fan (2013) simulates mergers in the market for US newspapers. She finds that mergers lead to a reduction in quality and content variety and these effects are most pronounced when there is large overlap between providers and when they are of similar size.[16]

Mazzeo et al. (2018) show that there is a trade-off in introducing or dropping varieties after mergers. On the one hand, increasing prices after a merger provide incentives to introduce varieties, but merging parties can save costs by not offering varieties with similar characteristics. They conduct a merger simulation and find that for most parameter values studied, the cost saving channel dominates and firms tend to drop products. Song (2015) estimates a model of demand for personal computers which he applies to the merger of HP and Compaq. He finds that following the merger, the merging firms differentiated products by including more low-end varieties in Compaq's product portfolio.

Gugler and Szücs (2022) estimate effects of mergers on prices and product variety in the pharmaceutical industry in Austria and distinguish between regulated and unregulated market segments. They find that mergers increased variety in regulated segments of the Austrian pharmaceutical market where price adjustments are not possible. In contrast, variety did not change significantly in regulated markets where prices tend to increase post-merger.

Ciliberto et al. (2021) develop a model to estimate the effects of mergers on entry, exit and pricing decisions simultaneously. They use their model to simulate the effects of mergers in the US airline industry. The authors show that the effects depend crucially on realized efficiency gains and pre-merger market structure. If efficiency gains are large, the new combined entity might enter new markets which were previously served by a monopolist, or not even a single firm, which increases variety in the market. However, this is unlikely to happen when there are no sizeable cost savings. In markets previously characterized by a duopoly of the merging firms, variety is likely to fall since a possible reduction of variety of the merged entity has a lower probability of being compensated by the entry of rival firms.

Li et al. (2022) study the choice between entry, non-stop and connection flights for different routes in the US airline market, where non-stop flights are arguably of higher perceived quality to consumers. They find that, after airline mergers, non-merging rivals started to offer non-stop flight routes in four out of 16 routes with pre-merger overlap of the merging firms across three merger cases. In cases where entry took place, prices of the incumbent merging firms tended to remain constant or increase by a small amount only, but prices were increasing substantially

[16] George (2002) finds a positive association between ownership concentration and variety in the same industry.

in markets without entry. This indicates that rival entry can sometimes mitigate price effects of a merger, but this is unlikely to lead to price decreases. The authors provide evidence that firms did not refrain from entry because of efficiency gains by the merging firms but because of a lack of competitiveness. They also discuss remedies that have been imposed after the American Airlines / US Airways merger. A remedy introduced by US authorities required American Airlines to introduce non-stop services for routes in which they overlapped with US Airways. Another remedy was to divest slots and gates to a low-cost competitor in order to keep the number of options that consumers could choose from fixed.

Wollman (2018) develops a model which allows analyzing product entry and exit after a merger. Post-merger, the new combined entity might have products that have identical or very similar characteristics. In this case, firms have an incentive to drop varieties if the scrap value of capital associated with its production (or the fixed cost) is higher than the contribution to profits. Similar product offerings often cannibalize each other and might thus contribute very little to overall profits – or at least less than before the merger. Alternatively, the prospect of higher margins in the market after a merger might induce other firms to enter the market – or introduce new varieties. Wollman uses data on the truck industry and simulates the effects of an acquisition of GM and Chrysler by different buyers. He finds that precisely in cases where markup increases are largest – which is the case when the acquirer has a large product overlap with GM and Chrysler – product entry has the largest dampening effects on price increases although entry is unlikely to completely offset price increases.

Fan and Yang (2020a) study the relationship between competition, the number of products and varieties in the US smartphone market. The authors find that endogenous product adjustment after a merger may exacerbate the negative consequences of mergers on consumer welfare. In the market they study, oligopolistic competition leads to inefficiently little variety and this effect is amplified by a merger. However, as the authors argue, it theoretically possible that oligopolistic competition leads to inefficiently few or inefficiently many products and varieties. The reason is that firms do neither internalize business-stealing effects of more variety nor the increased consumer surplus from more variety. However, multi-product firms might introduce inefficiently few products to avoid cannibalization. After a merger, merging firms might reduce variety as they internalize the business stealing effect. However, the increase in prices after a merger might make it more profitable for some competitors to introduce new varieties. Hence, the overall effect remains ambiguous.

Fan and Yang (2020a) simulate the effects of different mergers in the US smartphone market. In all simulated cases, their model predicts a significant reduction in product variety. This result is remarkably robust towards several variations in the specification of the demand model, the supply side and the type of merger simulation. The authors also provide robust evidence that

there is too little variety in the market so that mergers reducing variety unambiguously reduce total welfare.

Doi and Ohashi (2021) analyze the effects of an airline merger on quality provision in the form of flight frequencies in the Japanese market. They estimate significant efficiency gains from the merger. Due to these efficiency gains, which materialize in lower marginal costs per flight, quality provision has improved through the merger. Similarly, Prince and Simon (2017) analyze the effects of five US airline mergers on product quality and find positive long-run effects from efficiency gains on quality provision in the form of on-time-performance, even though there appear to be negative short-run effects. Chen and Gayle (2021) estimate effects of airline mergers on routing quality (measured as a fraction of non-stop flight distance). They find that mergers increase quality when there is no pre-merger competition between merging firms due to coordination but decreases quality provision in markets with pre-merger overlap.[17]

Fan and Yang (2020b) estimate the effects of mergers on firm entry, product variety and prices in the US retail craft beer market. They focus on transactions where a large brewery acquires multiple craft breweries. The results of merger simulations suggest that, in most markets, merging firms drop products while non-merging competitors tend to add products. They find that large markets tend to experience an overall increase in product variety after mergers, while in smaller markets the opposite results are obtained. However, these variety introductions are not sufficient to compensate welfare losses from price increases. The overall effects of mergers on variety in this market depend on product substitutability, fixed costs and market sizes. When product substitutability between merging firms and their market power is high, they are more likely to drop products, but product entry by rivals is also more likely.

Garrido (2020) simulates effects of a merger between to large players on variety in the ready-to-eat cereal industry. His results indicate that the merging parties would drop about 30% of their products post-merger which leads to a large loss in consumer welfare. Rossi (2020) also estimates negative effects of variety using a dynamic oligopoly model for the same industry.

Herrera-Araujo and Piechuka (2021) analyze the effects of mergers on product repositioning in the French hospital industry. They find that post-merger, merging hospitals tend to differentiate their services from each other which is consistent with a non-cannibalization strategy. This result is consistent with the predictions of a theoretical model. This model also predicts that mergers improve product quality due to economies of scale rendering the overall effect of hospital mergers on consumer surplus ambiguous.

Eliason et al. (2020) study effects of mergers, in which independent dialysis facilities have been taken over by large firms, on quality. They find that post-merger, quality in the form of

[17] Crawford, Shcherbakov and Shum (2019) discuss quality over-provision of monopolists in the US cable television market.

nurses' skills, mortality and hospitalizations decreases. The authors, however, argue that this does not result from increased market power but from the adoption of acquiring firms' strategies.

3.2 Non-horizontal mergers

The majority of studies find positive effects of vertical mergers on product quality. For instance, Hansman et al. (2020) estimate a positive effect of vertical integration on quality provision of fish meal producers. Gil and Warzynski (2015) find positive effects on product quality in the US video game industry. Chipty (2001) and Crawford and Yurukoglu (2012) document positive effects of vertical integration on quality (channel coverage) in the US cable TV industry. To our knowledge there is little empirical evidence which systematically analyzes consequences of vertical mergers on variety.[18] From a theoretical point of view, the relationship is ambiguous as in the case of horizontal mergers. On the one hand, vertical integration could lead to more variety if efficiency gains, realized by the merged entity, make product introductions more profitable. On the other hand, if the merger leads to input foreclosure, this might lead to the exit of rival firms or prevent entry of new varieties.

Recently, there has been increasing interest in the effects of conglomerate mergers in which there are no direct horizontal or vertical links between the merging parties. Conglomerate mergers are relevant for competition policy if they concern "neighboring markets" that produce products that are offered to the same consumers but are only weak substitutes (Neven, 2007). The increasing interest mainly stems from the digital sector in which conglomerate mergers are common which often involve complementary products.[19] Potential gains from conglomerate mergers include benefits from one-stop shopping, a reduction of prices, and increased incentives to invest in R&D due to an internalization of externalities across complementary products. However, conglomerate mergers can also have anticompetitive effects. The main concern is that bundling and tying of complementary products may lead to foreclosure which may not only lead to higher prices but also lower R&D investment and ultimately less variety that consumers can choose from. For instance, as shown by Choi and Stefanadis (2001), bundling by incumbent firms can reduce the profitability of entry and R&D investment by potential entrants since they need to rely on other firms to enter the market that provides the complementary product. Recently, theories of harm have been developed were bundling and tying can hurt consumers even in the absence of foreclosure. For instance, Chen and Rey (2021) argue that bundling of products by merging firms may increase product

[18] See the surveys of related literature in Beck and Scott Morton (2021) and Slade (2021).
[19] See Motta and Peitz (2021) and Bourreau and Streel (2019) for an overview of mergers and merger policy in digital markets and Argentesi et al. (2021a) for a discussion of ex post evidence.

differentiation between the merged entity and its rival firms. This can soften competition in a way that hurts consumers.

Empirical evidence on the effects of conglomerate mergers on variety is scarce. Gautier and Lamesch (2020) conduct an ex post evaluation of 175 acquisitions undertaken by Google, Amazon, Facebook, Apple and Microsoft. Most of these cases involve relatively small acquisition targets in related business segments. The authors argue that except for one case, these transactions are unlikely to be killer acquisitions as they do not involve potential competitors. Nonetheless, they find that 60% of target firms' products are shut down upon acquisitions. Since the authors do not compare target firms to a control group of non-acquired firms, it is not clear whether this number reflects a causal effect of acquisitions and the results are only suggestive of negative effects on variety.

Argentesi et al. (2021a) analyze acquisitions by Amazon, Google and Facebook in more detail. They find that these acquisitions have allowed the acquiring firms to gain access to latest techniques in machine learning, artificial intelligence, analytics and big data. They argue that while such acquisitions may increase efficiency of the acquiring firms, the increasing collection of big data in combination with network effects might allow them to create barriers to entry for competitors which could ultimately reduce variety. Argentesi et al. (2021a) discuss two merger cases under scrutiny by UK competition authorities in more detail. For the Facebook/Instagram case, they argue, among other things, that the competition authority might have underestimated Instagram's potential to grow into social networking services. Further, they argue that the competition authority has put too little emphasis on the role of interoperability between Instagram and other social networks and that interoperability has decreased after the merger. Argentesi et al. (2021a) also discuss Google's acquisitions of Waze, a company which provided a navigation app for smartphones. The authors argue that the UK competition authority potentially underestimated the growth potential of Waze's navigation app and how the merger affected Google's position as a provider of location data and therefore its position in the online advertising market.

3.3 Merger cases related to variety and choice

Effects on variety and choice have mainly affected the European Commission's merger decisions in cases of conglomerate mergers where bundling and tying of complementary products has been a concern.

For instance, the merger between *Intel / McAfee* (cleared subject to remedies in 2011) involved CPUs and IT security solutions. One concern was that Intel could affect the interoperability between security software and hardware to the advantage of McAfee software and to the

disadvantage of its competitors. Specifically, the Commission was worried that Intel could degrade interoperability by conveying information about CPU performance-related parameters exclusively to McAfee and that Intel could optimize interfaces according to McAfee's design preferences. They were also worried that Intel would technically tie McAfee's software solutions into Intel hardware. Further, concerns were raised about commercial bundling of products. These possible strategies together could imply exit by competitors or reduced incentives for entry which would lower variety in the relevant markets. Remedies included, among others, commitments by the merging parties that no degradation on interoperability of McAfee software would occur and that instructions, interoperability and optimization information is documented and available for use by third party vendors of security software. Further, Intel committed to employ at least ten software engineers to assist third party vendors in implementing Intel technologies. Intel also agreed to disclose technological means by which (pre-installed, i.e., bundled) endpoint security software could be disabled that would interfere with security software by other providers.

In the *Qualcomm / NXP* case (cleared subject to remedies in 2018), the acquirer, Qualcomm, developed baseband chipsets for smartphones while NXP supplied chips for smartphones and a technology (MIFARE) used as ticketing platforms by several transport authorities. Concerns were raised that the merged entity would have the ability and incentive a) to make it more difficult for other suppliers to access MIFARE through less or more expensive licensing, and b) to degrade interoperability with Qualcomm's baseband chipsets with the products of competitors which would lead to lower choice for smartphone manufacturers. Finally, the merged entity owned a significant patent portfolio which could allow it to demand higher royalties for near-field communication technologies. Remedies included a commitment of Qualcomm to license MIFARE technology on similar terms as before the merger for a period of eight years and a commitment to ensure that it would provide the same level of interoperability between Qualcomm's baseband chips and rival products compared to those products acquired from NXP. Further, Qualcomm committed not to acquire essential patents, but these were transferred to a third party which was required to provide royalty-free licenses for three years worldwide.

In the *Google/Fitbit* case (cleared subject to remedies in 2020), concerns were raised regarding Google's access to data from Fitbit, a company which manufactured smartwatches and fitness trackers. A specific concern was whether Google would combine this data with his own to strengthen its position in online adverting markets and in the digital health sector. The commission also investigated whether Google could impede interoperability between the Android operating system with wearable devices by rival firms in a foreclosure strategy. The transaction was approved subject to remedies which included an interoperability commitment. Google agreed to offer royalty-free licenses of its Android operating system to application

programming interfaces that wearable devices need to communicate with an Android smartphone. Google also agreed to keep core functionalities of application programming interfaces (APIs) and its future improvements in open source code. Finally, Google had to commit to grant access to original equipment manufacturers for all Android APIs that it makes available to Android smartphone app developers.

The *Broadcom/Brocade* merger (cleared by the European Commission in 2017) raised concerns about complementarities between Broadcom's chips needed for Fibre Channel Storage Area Networks and Internet Protocol networking products on the one hand, and switches and cards for Fibre Channel Storage Area Networks produced by Brocade on the other hand. For instance, the Commission was worried that confidential information from competitors could be used by the merged entity to favour its own products. The Commission also raised concerns that the merged entity could degrade the interoperability between its own Fibre Channel switches and the host bus adapter (HBA) cards of rivals to the benefit of its own HBA cards. To address these concerns, Broadcom committed to cooperate closely and in a timely manner with competing HBA cards suppliers to achieve the same level of interoperability as that of its own HBA cards and to protect third party confidential information.

The merger between *Nvidia and Mellanox* (cleared in 2019) involved complementarities between graphic processing units (GPUs) and network interconnects which play important roles in datacenters. A concern raised by rival firms AMD and Intel was that the merged entity could leverage Mellanox's market power in high performance fabric and for Ethernet NICs into the market for datacentre GPUs and that this would lead to foreclosure of competitors in the datacentre GPU market. The Commission investigated whether the merged entity would have incentives and ability to engage in bundling and /or tying of its products and whether the resulting impact on the relevant market could ultimately affect the choice of consumers. However, the Commission concluded that the majority of NVIDIA's discrete data centre GPU sales were used to equip data centres that do not use Mellanox's InfiniBand fabric. Another important aspect in the investigation was the importance of economies of scale, specifically whether AMD and Intel could still reach their minimum efficient scale if they were partly foreclosed from the GPU market. The commission concluded that this was the case, specifically given the predicted growth of AMD's market share. It also concluded that the merged entity would refrain from a foreclosure strategy since AMD and intel could retaliate by degrading interoperability with their CPUs.

The acquisition of *Varian by Siemens Healthineers* has been cleared subject to remedies in 2021. Siemens Healthineers supplied medical imaging solutions used to support the planning and delivery of radiotherapy. Varian supplied radiotherapy solutions used to plan and deliver radiotherapy treatment which uses radiation to treat cancer. The Commission had concerns

that the transaction could lead to the foreclosure of competitors in the market for the supply of medical imaging solutions and the supply of radiotherapy solutions, through the degradation of interoperability. Particularly, the Commission was concerned about interoperability between Siemens Healthineers' imaging solutions and third-party radiotherapy solutions, and about interoperability between Varian's radiotherapy solutions and third-party medical imaging solutions, and the resulting loss of variety available to customers and patients. To address the Commission's competition concerns, Siemens Healthineers committed to providing the relevant information and technical assistance to third parties and customers to ensure interoperability in the relevant markets. It also committed to stick to the de facto industry-wide interoperability standard.

3.4 Summary and policy implications

The theoretical literature has mainly focused on three different channels of how *horizontal* mergers affect variety. First, merging firms have an incentive to drop competing varieties within the newly combined firm to avoid cannibalization and save fixed costs. Second, due to higher markups post-merger, it might become more profitable for firms (especially non-merging rivals) to introduce new products. Third, efficiency gains can make introduction of new varieties profitable. As pointed out by Asker and Nocke (2021), due to these countervailing channels, the overall effects of mergers are likely to depend on industry structure and the mode of competition.

All in all, results on the effects of mergers on product variety and repositioning are mixed. While this is true for both theoretical and empirical analyses, the literature suggests that the results are unlikely to be positive in those cases that are most relevant for competition policy. For instance, empirical evidence indicates that variety tends to decrease after mergers in highly concentrated markets. This is also in line with the predictions of theoretical models which use the most common demand specifications. In those cases, where results indicate an increase in variety, this is usually not sufficient to compensate welfare losses from higher markups. Often, variety increases due to an effort to prevent entry or reposition the product portfolio in a way that reduces competition which is also likely to be detrimental to consumer welfare. Overall, it is unlikely that increases in variety provided by rivals turn an otherwise welfare-reducing merger into a welfare-increasing transaction. Most plausible scenarios under which variety responses would improve the welfare consequences of mergers are in the case of efficiency gains. In our opinion, a merger that does not generate substantial cost savings, is unlikely to improve overall product variety in most markets.

Merger policy should try to measure a few factors ex ante that support a particular channel. For instance, the internalization of the business-stealing effects is larger the higher the

substitutability between products of merging rivals and the higher the fixed costs of production per variety. Measurement of substitutability between products of merging firms (e.g., diversion ratios) and information about fixed costs of product entry or the scrap value of existing production facilities are informative for this purpose. For instance, fixed costs (and scrap values) are likely to be much larger in the manufacturing industries compared to retail sector.

Since rivals' variety increase might partly compensate for the loss in variety by merging firms' product, it is also important to analyze incentives of existing and prospective competitors. Market size arguably plays an important role as well as entry costs which might be higher for firms that enter a market for the first time. Finally, as efficiency gains can potentially induce product entry, it is important to predict cost savings ex ante. For instance, Ciliberto et al. (2021) discuss plausible scenarios where the merged entity adopts the best characteristics of both pre-merger firms or the newly combined firms operates according to the average (weighted) performance of pre-merger firms.

Empirical framework to simulate entry and variety decisions are, for instance, provided in recent papers by Fan and Yang (2021) and Ciliberto et al. (2021), which allow an estimation of bounds on fixed costs, markups from demand estimation exercises and allow simulating resulting effects on variety.

The effects on product quality are likely to be industry specific as well. We already discussed results on innovation activities which include incentives for investment in quality upgrading in previous sections. In other industries, such as airlines and media markets, as discussed above, quality may not be the result of formal innovation activity but depends on the decision which products and services to make available in specific markets. The results of empirical studies indicate that market power increases from merger tend to reduce incentives to provide high-quality products. However, efficiency gains can sometimes benefit consumers in the form of higher quality as for instance, demonstrated in some studies on airline markets.

For non-horizontal mergers, evidence regarding the effects on variety from ex post evaluations is, in our view, too thin to draw general conclusions. However, there is suggestive evidence that brands acquired by the big tech companies are often shut down upon acquisition. This suggests that incentives to reduce variety should play an important role in merger review, even when acquisitions involve relatively small target firms that are not direct competitors. Further, there is suggestive evidence that non-horizontal mergers can sometimes affect interoperability and create barriers to entry which may have an effect on variety supplied by competitors or potential entrants. The latter effect has been considered by the European Commission in some merger cases as we discussed in the previous subsection.

4. Sustainability

In principle, the effects of mergers on sustainability can be, by and large, analysed within the existing frameworks. The OECD (2021, pp. 35-38) identifies four theories of harm related to mergers and sustainability: (1) The increasing market power resulting from the merger may lead, through unilateral effects, to higher prices for green products, lower green quality and less green innovation. (2) A second horizontal theory of harm relates to a merger leading to increased buyer power, and (3) a third theory of harm relates to unilateral effects on the pace and amount of innovation in an industry. Finally, (4) a "fourth theory of harm related to innovation concerns 'green killer acquisitions', which are acquisitions of more sustainable competitors aimed at alleviating competitive pressure to produce greener or less polluting products" (OECD, 2021, p. 38). While the OECD also identifies, as a so far only theoretical issue, potentially anticompetitive mergers associated with environmental benefits, there is no case reported. In a theoretical paper, Fikru and Gautier (2020) show, however, that even in a highly concentrated industry a further merger may increase or decrease welfare depending on (1) the merger threshold and (2) the pollution intensity of the firms. They also show that the relationship between welfare and size of merger can be affected by exogenous factors such as emission taxes. Similarly, Choi, Espínola-Arredondo and Muñoz-García (2022) show that mergers can be anti-competitive, but positive for the environment if an increase in market power leads to a reduction of quantities produced.

Moreover, firms may hypothetically claim green efficiencies, but this has only been a theoretical option, so far. Overall, the theories of harm identified by the OECD can well be addressed under the current merger guidelines.

In its merger enforcement practice, the Commission already accounts for a taste for sustainable products in its market definitions for quite some time now. For example, in *Chiquita Brands International/Fyffes* (2015) or *DEMB/Mondelez/Charger OPCO* (2015), different market segments were defined for conventional products on the one hand and organic or FairTrade products on the other hand. In addition, environmental factors are integrated in the Commission's assessment of competition in markets relevant for a green economy. Environmental factors, driven by demand-side preference and regulatory targets, can significantly affect the state of competition, for example, in recycling markets (that were dealt with in the acquisition of several waste management companies, owned by Suez, in Germany, Luxembourg, the Netherlands and Poland by Schwarz Group).

Empirical literature on the effects of mergers on sustainability, or green innovations in particular, is more than scant. In a recent paper, Liang et al. (2022) study mergers and acquisitions of heavy polluting enterprises in China between 2010 and 2018 and find a positive correlation between M&As and green innovation, also fostered by Government subsidies.

However, the authors neither establish a causal relationship nor do they distinguish between horizontal and non-horizontal mergers. Their results are, however, in line with the recent findings by da Cruz and Newham (2022) in their study of mergers and acquisitions in the US power and utilities sector. The authors examine the effect of mergers and acquisitions particularly on *green* innovations, using data on patent applications data provided by the US Patent and Trademark Office (where they classify "green patents" using EPO's Y02-tagging scheme). Using a combination of matching techniques and a DiD approach they find that in their particular case mergers may have had a positive effect on green innovations. However, da Cruz and Newham (2022) do not distinguish between horizontal and vertical or conglomerate mergers, so the results should be treated with a note of caution regarding more general competition policy implications. Also note that these studies do not examine how mergers affect innovations more generally, i.e., including non-green innovations.

Beyond this lies a more general question: Do we need to include green policy objectives into competition policy[20] or should the pursuit of green policy objectives be rather left to other policy fields such as environmental policy, climate policy, energy policy and so on which tend to have instruments that can target the objectives in a much more accurate manner? While there is some general discussion on this matter this discussion mainly refers to agreements between undertakings and not to mergers. Given that the European Commission is just reforming its horizontal block exemption regulations (HBER) and its guidelines on horizontal cooperation, which now specifically includes "sustainability agreements" and given the limited experience in this area, it appears premature to draw any conclusions and recommendations with respect to merger policy in this field.

5. Mergers and labour market outcomes

The question how competition policy in general and merger policy in particular affects labour market outcomes has recently been receiving more attention. The discussion on labour markets and competition policy has its roots in the US, but is also exported to Europe now. In more detail, a number of US scholars vividly argue that antitrust policies, including merger policy, should also account for workers' interests and competition authorities should also focus on labor market monopsonies (see, e.g., Marinescu and Hovenkamp, 2019; Posner, 2021). Indeed, empirical evidence form hospital mergers in the US suggest that higher regional market concentration in the hospital industry may lead to lower growth rates for wages, in particular for skilled workers (see Prager and Schmitt, 2021). From a competition policy

[20] Aghion et al. (2020) discuss the general relationship between sustainability and competition.

perspective this is good news. More competition is not only good for consumers, but for employees alike.[21]

However, it remains to be seen at this point how general the empirical finding of Prager and Schmitt (2021) will be. Notably, the finding stands in stark contrast to much older findings by Neven and Roeller (1996) who have studied European airline markets. They develop a simple structural model which is estimated using data from 1976-1990 for eight European airlines. Neven and Roeller (1996) find strong support for the hypothesis that lax competition induces extensive rent sharing through excessive wages. Their finding may also help to explain why unions often tend to be against efforts to liberalise product markets (e.g., through regulatory reforms or the removal of trade barriers). The differences between the findings of Prager and Schmitt (2021) and Neven and Roeller (1996) may have several reasons. Most obviously, unions play quite a different role in Europe vis-à-vis the US and labour market regulations also differ quite generally in many respects.

In the case where low competition is associated with higher markups and more rent sharing, there is, in our opinion, a fundamental problem if competition authorities were tasked with pursuing labour market objectives. Competition agencies would find an inevitable trade-off between consumer surplus and higher wage rates. Hence, we would not suggest to task competition authorities with the pursuit of labour market objectives when such a trade-off is likely.

6 Conclusion

In this paper, we review the literature on non-price effects of mergers. Specifically, we focus on the effects on innovation, product variety, repositioning and quality and briefly discuss results related to sustainability and labour market power. We also discuss implications for merger policy.

We start with the effects of mergers on innovation. The vast majority of ex post evaluations has estimated large negative effects on innovations inputs and outputs. The key challenge for competition authorities is, however, to identify mergers that reduce innovation on the relevant market ex ante. This is inherently difficult since innovation outcomes are sometimes (very) hard to measure. As innovations are not always patented, there is often no obvious observable measure (unlike revenues, volumes or market shares). While in some industries such as pharmaceuticals, agrochemical or medical devices, innovation can be assessed relatively easily by reviewing clinical trials and analyzing the parties' product development pipelines, in

[21] Montag (2021) analyzes how a merger affects US employment when there is no change in labour market power.

other industries the task is much less straightforward. This is particularly true for digital markets. Hence, a rebuttable presumption for horizontal mergers appears to be warranted.

The competitive assessment of future markets requires the difficult task of identifying the strength of competitors and alternatives. For new drugs in early stages of development, information on their efficacy and side effects will be far from established, however.

There are inherent uncertainties regarding research outcomes. For instance, pipeline drugs at an early phase of development only face a small probability of success. Only approximately 11% of pharmaceutical products in stage I clinical trials actually get to market. While the European Commission had initially focused on drugs close to market introduction, i.e., phase III pipelines, it has more recently also considered pipeline products in earlier stages of development.

While it is inherently difficult to predict future competition, there are various indicators that may help competition agencies assessing the potentials. The necessary standard of proof may need to be lowered though, as, while it is more difficult to predict innovation processes, the consequences for social welfare are likely to be more severe than from a loss of static competition (i.e., simple price increases). If the standard of proof is lowered for showing likely negative innovation effects of a merger, however, the standard to prove efficiencies for the merging parties may possibly also need to be lowered. In addition, the prediction time span may also need to be adjusted when compared to price effects.

References

Aghion, P., N. Bloom, R. Blundell, R. Griffith & P. Howitt (2005). Competition and innovation: An inverted U relationship. *Quarterly Journal of Economics*, 120 (2), 701-728.

Aghion, P., R. Bénabou, R. Martin & A. Roulet (2020). Environmental preferences and technological choices: Is market competition clean or dirty National Bureau of Economic Research (NBER) Working Paper No. w26921.

Argentesi, E., P. Buccirossi, E. Calvano, T. Duso, A. Marrazzo & S. Nava (2021a). Merger policy in digital markets: an ex post assessment. *Journal of Competition Law & Economics*, 17(1), 95-140.

Argentesi, E., P. Buccirossi, R. Cervone, T. Duso & A. Marrazzo (2021b). The effect of mergers on variety in grocery retailing. *International Journal of Industrial Organization*, 79, article 102789.

Arts, S., B. Cassiman & J.C. Gomez (2018). Text matching to measure patent similarity. *Strategic Management Journal*, 39(1), 62-84.

Arrow, K. (1962). Economic welfare and the allocation of resources for invention, in *The Rate and Direction of Inventive Activity: Economic and Social Factors*, Princeton University Press, pp. 609-626, online at: https://www.nber.org/system/files/chapters/c2144/c2144.pdf.

Arundel, A. & I. Kabla (1998). What percentage of innovations are patented? Empirical estimates for European firms. *Research Policy*, 27(2), 127-141.

Ashenfelter, O. C., D. S. Hosken & M. C. Weinberg (2013). The price effects of a large merger of manufacturers: A case study of Maytag-Whirlpool. *American Economic Journal: Economic Policy*, 5 (1), 239-261.

Asker, J., & V. Nocke (2021). Collusion, mergers, and related antitrust issues. In: K. Ho, A. Hortacsu & A. Lizzeri (eds.), *Handbook of Industrial Organization*, Vol. 5, pp. 177-279. Elsevier: Amsterdam.

Atalay, E., Hortacsu, A. & C. Syverson (2014). Vertical integration and input flows. *American Economic Review*, 104 (4), 1120-1148.

Atalay, E., A. Sorensen, W. Zhu & C. Sullivan (2020). Post-merger product repositioning: An empirical analysis. Federal Reserve Bank of Philadelphia Working Paper Number 20-36.

Autor, D., D. Dorn, G. H. Hanson, G. Pisano & P. Shu (2020). Foreign competition and domestic innovation: Evidence from US patents. *American Economic Review: Insights*, 2 (3), 357-374.

Beck, M. & F. Scott Morton (2021). Evaluating the evidence on vertical Mergers. *Review of Industrial Organization*, 59, 273-302.

Bena, J. & K. Li (2014). Corporate innovations and mergers and acquisitions. *Journal of Finance*, 69 (5), 1923-1960.

Bennato, A. R., S. Davies, F. Mariuzzo & P. Ormosi (2021). Mergers and innovation: Evidence from the hard disk drive market. *International Journal of Industrial Organization*, 77, article 102755.

Berry, S. T & J. Waldfogel (2001). Do mergers increase product variety? Evidence from radio broadcasting. *Quarterly Journal of Economics*, 116 (3), 1009-1025.

Bertrand, O., K. N. Hakkala, P.-J. Norbäck & L. Persson (2012), Should countries block foreign takeovers of R&D champions and promote greenfield entry?, *Canadian Journal of Economics*, 45 (3), 1083-1124.

Blonigen, B. A., L. Fontagné, N. Sly & F. Toubal (2014). Cherries for sale: The incidence and timing of cross-border M&A. *Journal of International Economics*, 94 (2), 341-357.

Bombardini, M., B. Li & R. Wang (2018). Import competition and innovation: Evidence from China. Working paper.

Bourreau, M., B. Jullien & Y. Lefouili (2021). Mergers and demand-enhancing innovation. CEPR Discussion Paper No. DP16031.

Bourreau, M., & A. de Streel (2019). Digital conglomerates and EU competition policy. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3350512.

Bryan, K. A., J. Lemus & G. Marshall (2022). R&D competition and the direction of innovation. *International Journal of Industrial Organization*, 82, article 102841.

Calvano, E. & M. Polo (2021). Market power, competition and innovation in digital markets: A survey. *Information Economics and Policy*, 54, article 100853.

Cassiman, B., M. G. Colombo, P. Garrone & R. Veugelers (2005). The impact of M&A on the R&D process: An empirical analysis of the role of technological-and market-relatedness. *Research Policy*, 34 (2), 195-220.

Cohen, W. M., R. Nelson & J. P. Walsh (2000). Protecting their intellectual assets: Appropriability conditions and why US manufacturing firms patent (or not). NBER working paper 7552.

Chen, Y., & Gayle, P. G. (2019). Mergers and product quality: Evidence from the airline industry. *International Journal of Industrial Organization*, 62, 96-135.

Chen, Z. & P. Rey (2021). A Theory of Conglomerate Mergers, mimeo.

Chipty, T. (2001). Vertical integration, market foreclosure, and consumer welfare in the cable television industry. *American Economic Review*, 91 (3), 428-453.

Choi, J. P. & C. Stefanadis (2001). Tying, investment, and the dynamic leverage theory. *Rand Journal of Economics*, 32 (1), 52-71.

Choi, P.-S., A. Espínola-Arredondo & F. Muñoz-García (2022). Environmental policy helping antitrust decisions: Socially excessive and insufficient merger approvals. *Resource and Energy Economics*, 67, article 101267.

Ciliberto, F., C. Murry & E. Tamer (2021). Market structure and competition in airline markets. *Journal of Political Economy*, 129 (11), 2995-3038.

Ciliberto, F. (2006). Does organizational form affect investment decisions?, *Journal of Industrial Economics*, 54 (1), 63-93.

Crawford, G. S. & A. Yurukoglu (2012). The welfare effects of bundling in multichannel television markets. *American Economic Review*, 102 (2), 643-685.

Crawford, G. S., O. Shcherbakov & M. Shum (2019). Quality overprovision in cable television markets. *American Economic Review*, 109(3), 956-995.

Cunningham, C., F. Ederer & S. Ma (2021). Killer acquisitions. *Journal of Political Economy*, 129 (3), 649-702.

da Cruz, V. & M. Newham (2022). The impact of mergers on green innovation. Available at SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4236137

Doi, N. & H. Ohashi (2019). Market structure and product quality: A study of the 2002 Japanese airline merger. *International Journal of Industrial Organization*, 62, 158-193.

Dasgupta, P. & J. Stiglitz (1980). Uncertainty, industrial structure, and the speed of R&D. *The Bell Journal of Economics*, 11(1), 1-28.

Denicolo, V. & M. Polo (2018). Duplicative research, mergers and innovation. *Economics Letters*, 166, 56-59.

Eliason, P. J., B. Heebsh, R. C. McDevitt & J. W. Roberts (2020). How acquisitions affect firm behavior and performance: Evidence from the dialysis industry. *Quarterly Journal of Economics*, 135 (1), 221-267.

Entezarkheir, M. & S. Moshiri (2018). Mergers and innovation: Evidence from a panel of US firms. *Economics of Innovation and New Technology*, 27 (2), 132-153,

Fan, Y. (2013). Ownership consolidation and product characteristics: A study of the US daily newspaper market. *American Economic Review*, 103 (5), 1598-1628.

Fan, Y., & Yang, C. (2020a). Competition, product proliferation, and welfare: A study of the US smartphone market. *American Economic Journal: Microeconomics*, 12 (2), 99-134.

Fan, Y., & Yang, C. (2020b). Merger, product variety and firm entry: The retail craft beer market in California. Available at SSRN: https://ssrn.com/abstract=3681556.

Federico, G., G. Langus & T. Valletti (2017). A simple model of mergers and innovation. *Economics Letters*, 157, 136-140.

Federico, G., G. Langus & T. Valletti (2018). Horizontal mergers and product innovation. *International Journal of Industrial Organization*, 59, 1-23.

Fikru, M.G. & L. Gautier (2020). Are big mergers welfare enhancing when there is environmental externality?, *Energy Economics*, 87, article 104718.

Fumagalli, C., M. Motta & E. Tarantino (2020). Shelving or developing? The acquisition of potential competitors under financial constraints. Economics Working Papers 1735, Department of Economics and Business, Universitat Pompeu Fabra, online at: https://ideas.repec.org/p/upf/upfgen/1735.html

Gandhi, A., L. Froeb, S. Tschantz & G. J. Werden (2008). Post-merger product repositioning. *Journal of Industrial Economics*, 56 (1), 49-67.

Garrido, F. (2020). Mergers between Multi-Product Firms with Endogenous Variety: Theory and an Application to the Ready-To-Eat Cereal Industry. Georgetown University.

Gaudin, G. (2021). Quality and imperfect competition. Available at SSRN: https://ssrn.com/abstract=3693363.

Gautier, A. & J. Lamesch (2021). Mergers in the digital economy. *Information Economics and Policy*, 54, article 100890.

George, L. M. (2002). Ownership concentration and product variety in daily newspaper markets. In. L.F. Cranor & S. Greenstein (eds.), *Communications policy and information technology: Promises, problems, prospects*, MIT-Press, pp. 235–253.

Gil, R. & F. Warzynski (2015). Vertical integration, exclusivity, and game sales performance in the US video game industry. *Journal of Law, Economics, and Organization*, 31 (suppl 1), i143–i168.

Gilbert, R. J. (2006). Looking for Mr. Schumpeter: Where are we in the competition-innovation debate?, *Innovation Policy and the Economy*, 6., 159-215.

Gilbert, R. J. & D. M. G. Newbery (1982). Preemptive Patenting and the Persistence of Monopoly. *American Economic Review*, 72 (3), 514-526.

Gilbert, R. J. & H. Greene (2014). Merging innovation into antitrust agency enforcement of the Clayton Act. *George Washington Law Review*, 83 (6), 1919-1947.

Glader, M. (2004), Innovation Markets and Competition Analysis - EU competition law and US antitrust law, Ph.D. thesis, Lund University.

Grabowski, H. & M. Kyle (2008). Mergers and alliances in pharmaceuticals: effects on innovation and R&D productivity. In. K. Gugler & B. Yurtoglu (eds.), *The Economics of Corporate Governance and Mergers*, Edward Elgar: Cheltenham, pp. 262-287.

Greenstein, S. & G. Ramey (1998). Market structure, innovation and vertical product differentiation. *International Journal of Industrial Organization*, 16 (3), 285-311.

Grimpe, C. & K. Hussinger (2008). Pre-empting technology competition through firm acquisitions. *Economics Letters*, 100 (2), 189-191.

Guadalupe, M., O. Kuzmina & C. Thomas (2012). Innovation and foreign ownership. *American Economic Review*, 102 (7), 3594-3627.

Gutierrez, G. & T. Philippon (2017). Declining competition and investment in the US. Technical Report, National Bureau of Economic Research Working Paper 23583.

Hansman, C., J. Hjort, G. Léon-Ciliotta & M. Teachout (2020). Vertical integration, supplier behavior, and quality upgrading among exporters. *Journal of Political Economy*, 128 (9), 3570-3625.

Haucap, J., A. Rasch & J. Stiebale (2019). How mergers affect innovation: Theory and evidence. *International Journal of Industrial Organization*, 63, 283-325.

Herrera-Araujo, D. & J. Piechucka (2021). Hospital mergers can impact the offer of health care services. DIW Weekly Report, 11 (33), 239-245.

Igami, M. & K. Uetake (2020). Mergers, innovation, and entry-exit dynamics: Consolidation of the hard disk drive industry, 1996–2016. *Review of Economic Studies*, 87 (6), 2672–2702.

Jaffe, A. (1986). Technological Opportunity and Spillovers of R&D: Evidence from Firms' Patents, Profits, and Market Value. *American Economic Review*, 76 (5), 984-1001.

Jullien, B. & Y. Lefouili (2018). Horizontal mergers and innovation. *Journal of Competition Law & Economics*, 14 (3), 364-392.

Katz, M. L. (2020)., Big-tech mergers: Innovation, competition for the market, and the acquisition of emerging competitors. Available at SSRN: https://ssrn.com/abstract=3624380 or http://dx.doi.org/10.2139/ssrn.3624380.

Lafontaine, F. & M. Slade (2007). Vertical integration and firm boundaries: The evidence. *Journal of Economic Literature*, 45 (3), 629-685.

Lee, R. S., M. D. Whinston & A. Yurukoglu (2021). Structural empirical analysis of contracting in vertical markets. In: K. Ho, A. Hortacsu & A. Lizzeri (eds.) *Handbook of Industrial Organization*, Vol. 4, Elsevier: Amsterdam, pp. 673-742.

Li, S., J. Mazur, Y. Park, J. Roberts, A. Sweeting & J. Zhang (2022). Repositioning and market power after airline mergers. *RAND Journal of Economics*, 53(1), 166-199.

Malek, J., J. Seldeslachts & R. Veugelers (2022). Are M&As spurring or stifling innovation? Evidence from antidiabetic drug development. Unpublished working paper.

Malek, J., M. Newham, J. Seldeslachts & R. Veugelers (2022). Acquiring innovation: who, when, and what? Evidence from antidiabetic drug development. Unpublished working paper.

Mankiw, N. G. & M. D. Whinston (1986). Free entry and social inefficiency. *RAND Journal of Economics*, 17, 48-58.

Marinescu, I. & H. Hovenkamp (2019). Anticompetitive mergers in labor markets. *Indiana Law Journal*, 94 (3), 1031-1063.

Marshall, G. & A. Parra (2019). Innovation and competition: The role of the product market. *International Journal of Industrial Organization*, 65, 221-247.

Mazzeo, M. J., K. Seim & M. Varela (2018). The welfare consequences of mergers with endogenous product choice. *Journal of Industrial Economics*, 66 (4), 980-1016.

Mermelstein, B., V. Nocke, M. A Satterthwaite & M. D. Whinston (2020). Internal versus external growth in industries with scale economies: A computational model of optimal merger policy. *Journal of Political Economy*, 128 (1), 301-341.

Montag, F. (2021). Mergers, foreign entry, and jobs: Evidence from the U.S. appliance industry. Working Paper, University of Munich.

Moraga-Gonzalez, J. L., E. Motchenkova & S. Nevrekar (2022). Mergers and innovation portfolios. *Rand Journal of Economics*, forthcoming.

Morzenti, G. (2022). Antitrust Policy and Innovation. Mimeo, University of Bocconi.

Motta, M. & E. Tarantino (2021). The effect of horizontal mergers, when firms compete in prices and investments. *International Journal of Industrial Organization*, 78, article 102774.

Motta, M., & Peitz, M. (2021). Big tech mergers. *Information Economics and Policy*, 54, article 100868.

Neven, D.J. & L.-H. Röller (1996). Rent sharing in the European airline industry. *European Economic Review*, 40, 933-940.

Neven, D.J. (2007). The analysis of conglomerate effects in EU merger control. In: P. Buccirossi (ed.), *Handbook of Antitrust Economics*, MIT Press, Chapter 5.

Nocke, V. & N. Schutz (2018). An aggregative games approach to merger analysis in multiproduct-firm oligopoly. Technical Report, National Bureau of Economic Research.

Nocke, V. & M. D. Whinston (2022). Concentration thresholds for horizontal mergers. *American Economic Review*, 112(6), 1915-1948.

Nocke, V. & S. Yeaple (2007). Cross-border mergers and acquisitions vs. greenfield foreign direct investment: The role of firm heterogeneity. *Journal of International Economics*, 72 (2), 336–365.

OECD (2012). The Role of Efficiency Claims in Antitrust Proceedings. OECD Policy Roundtables. OECD: Paris.

OECD (2018). Considering non-price effects in merger control – Background note by the Secretariat, DAF/COMP(2018)2. OECD: Paris.

OECD (2021). Environmental Considerations in Competition Enforcement, Background Paper by the Secretariat, DAF/COMP(2021)4, OECD: Paris.

Ornaghi, C. (2009). Mergers and innovation in big pharma. *International Journal of Industrial Organization*, 27 (1), 70-79.

Pires, T. & A. Trindade (2018). Ex-post evaluation of mergers in the supermarket industry. *Review of Industrial Organization*, 52 (3), 473-496.

Posner, E. (2021), *How Antitrust Failed Workers*, Oxford University Press.

Prager, E. & M. Schmitt (2021). Employer Consolidation and Wages: Evidence from Hospitals. *American Economic Review*, 111(2): 397-427.

Röller, L.-H. (2010). Efficiencies in EU Merger Control: Do They Matter?, in: H. J. Ramser & M. Stadler (eds.), *Marktmacht*, Mohr Siebeck, Tübingen, 185-195.

Rey, P. & J. Tirole (2007). A primer on foreclosure. In: M. Armstrong & R. Porter (eds.), *Handbook of Industrial Organization*, Vol. 3, 2145-2220.

Rossi, F. (2020). Mergers with Endogenous Product Choice: The Case of the Ready-to-Eat Cereal Industry. Available at SSRN 3706364.

Salop, S. (2018). Invigorating vertical merger enforcement. *Yale Law Journal*, 127, 1962-1994.

Schmutzler, A. (2013). Competition and investment – A unified approach. *International Journal of Industrial Organization*, 31 (5), 477-487.

Schumpeter, J. A. (1942). *Capitalism, Socialism, and Democracy*. New York: Harper.

Shu, P. & C. Steinwender (2019). The impact of trade liberalization on firm productivity and innovation. *Innovation Policy and the Economy*, 19, 39-68.

Slade, M. E. (2021). Vertical mergers: A survey of ex post evidence and ex ante evaluation methods. *Review of Industrial Organization*, 58 (4), 493–511.

Song, M. (2015). A hybrid discrete choice model of differentiated product demand with an application to personal computers. *International Economic Review*, 56 (1), 265-301.

Stiebale, J. (2016). Cross-border M&As and innovative activity of acquiring and target firms. *Journal of International Economics*, 99, 1-15.

Sweeting, A. (2010). The effects of mergers on product positioning: evidence from the music radio industry. *RAND Journal of Economics*, 41 (2), 372–397.

Szücs, F. (2014). M&A and R&D: Asymmetric effects on acquirers and targets? *Research Policy*, 43 (7), 1264-1273.

Valletti, T. & H. Zenger (2021). Mergers with differentiated products: Where do we stand? *Review of Industrial Organization*, 58 (1), 179-212.

Veugelers, R (2017). Competition Policy and Innovation, Update to Veugelers, Reinhilde. 2012. “Innovation in EU merger control: Walking the talk”, Bruegel Policy Contribution 2012/708, presented at the Competition and Innovation Summer School (CISS) 2017.

Vives, X. (2008). Innovation and competitive pressure. *Journal of Industrial Economics*, 56 (3), 419-469.

Wollmann, T. G. (2018). Trucks without bailouts: Equilibrium product characteristics for commercial vehicles. *American Economic Review*, 108 (6), 1364-1406.

Yan, B. & J. Luo (2017). Measuring technological distance for patent mapping. *Journal of the Association for Information Science and Technology*, 68 (2), 423-437.

Zhang, Y. & T. W Tong (2021). How vertical integration affects firm innovation: quasi-experimental evidence. *Organization Science*, 32 (2), 455-479.

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