INNOVATION IN MERGER CONTROL



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We live in the knowledge economy where innovation is the primary driver of economic growth and improved quality of living. A growing proportion of innovation occurs in private firms via direct investments and often affected by mergers and acquisitions, at firms in the private sector, creating an intersection with competition policy. As innovation has become increasingly important, over the past few years, competition agencies have expanded and gradually elevated the status of innovation beyond that of an important channel in assessment of mergers or conduct on welfare. Promoting innovation is now often seen as a legitimate standalone objective. To facilitate a standalone analysis of innovation, competition agencies sometimes artificially define a separate market for R&D. This article discusses the considerations for forward looking economic analysis of dynamic innovation and R&D effects in mergers. Incorrectly measuring innovation or its future competitive effects has massive social and economic cost in a polarizing world where different important regions have differing mechanisms and objectives for innovation. This article proposes a comprehensive analytical framework to assess the effects of a merger, which specifies how firms make R&D investment decisions, how they finance R&D, how they innovate, and how they commercialize innovative products.

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I. INTRODUCTION

Traditionally, antitrust merger analysis has focused on prices consumers pay for existing products and on the ability and incentives of new rivals to enter and compete effectively in specific product markets. Over the past decade, however, competition enforcers have gradually endorsed a more forward-looking approach. In this new 'dynamic' framework, innovation plays a central role.

Innovation drives economic growth, as it leads to higher productivity and introduction of new products and services. Investments in innovation today shape competitive interactions in future product markets. In turn, the competitive outcomes in future product markets shape future innovation activity. Innovation often spreads across sectors, impacting the wider economy. For all these reasons, and because mergers can affect ability and incentive of firms to innovate, innovation rightly takes an important place in merger review analysis.

Alas, competition analysis of innovation is complex and inherently uncertain. This is for the following reasons:

- To properly characterize the way in which a merger is likely to affect innovation incentives, the authority must understand how competition in future product markets is likely to unfold and how the merger would affect that. This means that analysis of innovation will rest on potentially speculative assumptions about future competitive interaction among products in R&D pipelines, some of which may be a long time away from commercialization.
- A merger typically sets in motion multiple forces that often act on innovation incentives in opposing directions. It is difficult to assess how these forces are likely to balance out to determine the overall effect on innovation.
- A merger may spur innovation while, at the same time, introducing an upward pricing pressure in current and future markets. This requires a balancing of the merger's pro- and anti-competitive effects.
- The scope for merger-specific efficiencies in relation to innovation tends to be large compared to the scope for efficiencies in a static context. To the extent such efficiencies are cognizable, they should be acknowledged, which also leads to a difficult balancing exercise of weighing efficiencies against potential harmful effects.

Because of the complexities and inherent uncertainty in the assessment of innovation concerns, antitrust authorities are sometimes tempted to take shortcuts in the analysis of innovation. To this end, an authority may define a market for R&D and assess innovation in that market, separately from the merger's effects on prices in current and future product markets. While this approach to analysis makes the innovation theory of harm appear robust, certain, and the effects on consumers immediate, these appearances are false.

Indeed, standalone analysis underplays the role of uncertainty and easily overlooks important merger effects that work through future product markets on innovation incentives. The standalone analysis also does not allow for a consistent balancing of potentially opposing effects on consumer welfare via innovation and prices in current and future product markets. Moreover, such analysis easily leads to inconsistent treatment of different forces triggered by a merger: more subtle effects may be dismissed as highly uncertain, while straightforward — but no less uncertain ones — are taken into full consideration.

To avoid these pitfalls, innovation concerns should be assessed in a comprehensive framework that recognizes the link between innovation and competition in future product markets and makes the underlying assumptions explicit. In such comprehensive framework, various opposing effects can be identified and consistently balanced against each other. The assessment of innovation concerns should also factor in the inherent uncertainty that comes with analyzing competition in future markets, and how the merger is likely to affect it. Finally, the tolerance towards inherent uncertainty of innovation theories of harm should be balanced with a similar degree of tolerance towards uncertain cognizable efficiencies.

In the rest of the paper, we identify some of the key forces acting on innovation incentives that a merger may set in motion and discuss several sources of uncertainty in analysis of innovation. We consider a setting with horizontal R&D overlaps in Section 2, while addressing the non-horizontal R&D overlap setting in Section 3. We discuss various potential efficiencies in relation to innovation in Section 4.

II. COMPLEXITY OF INNOVATION THEORY OF HARM AND PITFALLS OF STANDALONE ANALYSIS

The US competition authorities have raised innovation concerns in over hundred merger cases since 1995, mostly allowing the mergers subject to remedies such as Intellectual Property ("IP") licensing or divestiture of R&D assets.² Since 2000, the EC also frequently raised innovation

² See Gilbert, R. (2020): Innovation Matters: Competition Policy for High-Technology Economy, MIT Press.



concerns. Some recent mergers where the US authorities or the EC raised innovation concerns include *Medtronic/Covidien* (2014), *Novartis/GSK* (2015), *GE/Alstom* (2015), *Pfizer/Hospira* (2015), *Broadcom/Brocade* (2017), *Celgene/Bristol-Myers* (2019), *Illumina/Pacific Biosciences* (2020 - abandoned), and *Roche/Spark* (2019). In 2017, the EC raised broad horizontal innovation concerns in *Dow/DuPont* in relation to early-stage R&D in innovation spaces comprising combinations of various crops and pests.

In mergers of firms with overlapping R&D projects, diversion of future sales of an innovative product of one of the merging firms to a substitute product of the other firm — innovation diversion — introduces a downward pressure on incentive of the merged firm to innovate. This is because the merged firm can partially internalize the innovation diversion by reducing R&D investments in products at stake.³ The innovation concern resembles the traditional static price concern in horizontal mergers. In a price-centric theory of harm, the merged firm internalizes pricing externalities between existing substitute products, resulting in an upward pricing pressure.⁴ In innovation theory of harm, the firm internalizes sales diversion that it expects in future product markets, which results in a downward pressure on innovation.

This analogy between static pricing concern and innovation concern is, however, incomplete. This is because a merger will often also introduce opposing forces that affect the innovation incentive positively. For example, the merger-induced relaxing of future product market competition results in the increase of expected margins on innovative products. In turn, the increased margins enhance the incentive for the merged firms to invest in R&D aimed at increasing future sales. This positive force on innovation incentive may — depending on the circumstances — offset the downward force due to internalization of innovation diversion.⁵ As a result, unlike with static price effects, the presumption that the merger effect on innovation is negative just because the firms' R&D programs overlap is not warranted.⁶

Due to potentially opposing multiple forces on innovation incentives that a merger sets in motion, antitrust analysis of innovation is inherently more complex than price analysis. This complexity creates temptation for antitrust authorities to analyze innovation in a separate market for R&D defined specifically for this purpose. The authority may thus focus on internalization of innovation diversion and rely on analogies to static price effects in the analysis of innovation. This standalone approach lends an innovation theory of harm a superficial appearance of robustness and certainty as it obviates the need to rely on potentially speculative assumptions about the competitive interaction in future product markets.

This appearance is, however, false. As discussed earlier, standalone analysis ignores (or downplays the role of) forces that affect innovation incentives positively or at least downplays their potential relevance. Moreover, a standalone analysis does not allow for the balancing of potentially opposing price and innovation effects. Indeed, a merger between two firms with overlapping R&D projects may result in higher future prices, while simultaneously boosting innovation incentives. The net effect on consumers depends on the balance of the two effects and the appropriate balancing can only be carried out in a comprehensive framework.

Even when properly assessed, innovation theories of harm are generally less certain than static price-centric theories of harm. First, as discussed above, a cogent innovation theory necessarily rests on assumptions about competitive interactions in future product markets; for products early in R&D pipelines this may be as much as 10 years in the future. The level of uncertainty about these assumptions is likely greater than that about assumptions on competitive interaction, and the effect of the scrutinized merger on those, in current product markets that the price-centric theories of harm rely on.

⁶ As established in economic theory, a merger between firms with overlapping R&D programs may reduce or boost innovation depending on assumptions on conditions of demand and supply and the nature of R&D, even in the absence of efficiencies. For example, Federico et al. (2018) and Motta and Tarantino (2018) identify conditions under which a merger may reduce innovation incentives. Federico, G., G. Langus & T. Valletti (2018): Horizontal mergers and product innovation, International Journal of Industrial Organization 59, 1-23. Motta, M. and E. Tarantino (2021): The effect of horizontal mergers, when firms compete in prices and investment, International Journal of Industrial Organization 78, 102774. Letina (2016) identifies conditions in which horizontal mergers may negatively affect R&D diversity. Letina, I. (2016): The road not taken: competition and the R&D portfolio, RAND Journal of Economics 47, 433-460. In contrast, Denicolo & Polo (2018) identify conditions where a horizontal merger may increase innovation incentives. Denicolo, V. and M. Polo (2018): Duplicative research, mergers and innovation, Economics Letters 166, 56-59. Whereas, Bourreau et al. (2021) characterize the forces that a merger between firms with overlapping R&D programs sets in motion and find that it can either increase or decrease overall innovation in the absence of efficiencies.



³ Bourreau et al. (2021) label this effect internalization of innovation externality.). Bourreau, M., B. Jullien, and Y. Lefouili (2021): Mergers and Demand-Enhancing Innovation, CEPR Discussion Paper No. DP16031. Jullien & Lefouili (2018) show that the internalization of innovation externality can also have a positive effect on innovation incentive if the merging firms invest in horizontal differentiation of their products. Jullien, B. & Y. Lefouili (2018): Horizontal mergers and innovation, Journal of Competition Law and Economics 14, 364-392.

⁴ The price effect is robust across various assumptions on the supply and demand conditions. Typically, remaining independent rivals will respond to the price increase of the merged firm by price increase.

⁵ Bourreau et al. (2021) decompose the effects of a merger of two firms with overlapping R&D projects. They identify three effects, in addition to internalization of innovation externality. First, a merger can lead to an increase in the merged firm's margins, which increases the incentive for the merged firm to innovate to increase demand. Second, a merger may reduce the merged firm's output, which reduces the incentive of a firm to innovate to increase its margins. Third, the merger can affect the return to investment per unit of output, which may increase or decrease the incentive to innovate.

Second, it is difficult to observe and accurately describe the process of innovation or creation of new knowledge in terms of inputs and outputs. While authorities may be able to establish with a satisfactory degree of confidence whether existing products or services are (close) substitutes or complements by analyzing their characteristics, this is harder to do with respect to intangible R&D inputs and outputs.⁷

Third, establishing the effect of a merger on innovation incentives requires balancing various opposing forces which may interact in subtle ways. In addition to the margin-boosting effect of the merger that enhances innovation incentive, rivals will often have incentives to increase their R&D in response to merger and thus alleviate innovation concern. Therefore, even with a good understanding of competitive interaction in future product markets balancing of various forces will likely be challenging and subject to considerable uncertainty.

The multiple factors that make analysis of innovation in a merger review uncertain contravene the calls for a more aggressive merger control in dynamic assessment framework. Additional reasons for caution arise in relation to so-called killer acquisition concerns, an extreme version of innovation concerns. Indeed, in some industries, such as internet platforms, it is hard to predict the evolution of business model and whether a potential acquisition target represents a future competitive threat or not. Because of that, preemptive acquisitions would be difficult to detect. In particular, given that identification of the competitive threat would be difficult for the acquirer, it is hard to see how an authority could establish whether the acquirer will likely (on balance of probabilities) discontinue a project or not. Moreover, a preemptive acquisition does not prevent other firms from entering in the future. The possibility of future entry may make such acquisitions unprofitable.

III. INNOVATION THEORY OF HARM IN NON-HORIZONTAL MERGERS

Non-horizontal mergers have traditionally been viewed as less likely to raise competition policy concerns. This is because they do not eliminate direct competition among independent sellers of substitute products. Moreover, such mergers frequently generate procompetitive effects. Nevertheless, non-horizontal mergers can be anticompetitive if they create the incentive and ability of the merged firm to engage in anticompetitive foreclosure.

A frequent concern of antitrust enforcers in several recent non-horizontal mergers is that the merged firm will have an incentive to worsen the terms of supply of R&D inputs (intermediate products or information) to ease the competitive pressure that prospective rivals would otherwise exert on it in future downstream product markets.

Another concern is related to the access to competitively sensitive confidential information in relation to R&D. In high-tech industries, independent vendors of complementary products at different levels of the value chain — for example, developers of advanced semi-conductor chips and certain software vendors — may exchange competitively sensitive information on features of future products while these are still in development. This allows the vendors to coordinate R&D and ensure that compatible products can be marketed early. A vertical merger or a merger between makers of complementary products may strengthen the ability and/or incentive to pass sensitive information acquired from third-party rivals between the two arms of the newly integrated company. Such information leaks could reduce the innovation incentives for the independent rival and the merged firm.¹²

The EC and U.S. authorities have raised concerns in relation to innovation in several recent non-horizontal mergers. For example, the EC was concerned that Qualcomm's acquisition of NXP, which was later abandoned, could lead to a decreased interoperability of NFC/SE chipsets

- 7 See Majure, W. R. (2021): Evaluating Innovation Theories of Harm in Merger Review: Economic Frameworks and Difficulties, The National Law Review.
- 8 In a static analysis of price effects, one may presume that rivals would increase their prices in response to the merged firm's price increase. This reaction of rivals reinforces the concern. In contrast, rivals may well increase their R&D effort in response to a reduction of innovation and this would reduce the concern with merger's innovation effects. See, e.g. Federico et al (2018) for details.
- 9 In killer acquisition theory, a dominant firm identifies a potential competitive threat from an innovative entrant, acquires the entrant, and shuts down its R&D program. Cunningham et al. (2021) present a theoretical economic model to explain the motive for such preemptive acquisitions and discontinuation of R&D programs. They also provide empirical evidence for the existence of this phenomenon in pharmaceuticals. Cunningham, C., F. Ederer, and S. Ma (2021): Killer Acquisitions, Journal of Political Economy 129.
- 10 See, e.g. Cabral, L. (2021): Merger Policy in digital industries, Information Economics and Policy 54, 100866.
- 11 For example, they may eliminate price externalities in the sales of complementary products the well-known elimination of double marginalization in vertical mergers or Cournot effect in mergers of complements. See "Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings," Official Journal of European Union, 2008/C 265/07.
- 12 Merger-specific risk of access to competitively sensitive confidential information about rival technology may be a valid reason for antitrust intervention. A caveat with this theory of harm is that the scope for merger-specific efficiencies may be large in precisely the circumstances where access to information raises concerns where independent firms need to exchange sensitive information and coordinate R&D to develop compatible products.



with third-party baseband chipsets, limiting their ability to effectively compete and ultimately harming consumers. Concerns were also raised in relation to the risk that vertically integrated firm would pass competitively sensitive information among the upstream and downstream arm. The EC assessed similar concerns in *Microsoft/LinkedIn*, *GE-Avio*, *Airbus-Safran*, *ASL-Arianespace*, *Broadcom-Brocade*, and *Illumina/Grail*.

When considering whether to engage in anticompetitive foreclosure of inputs relevant to R&D, the merged firm would assess expected profit gains and losses from foreclosure in future product markets. A well-specified innovation theory of harm must mirror this assessment. Such theory of harm will therefore, just like in a setting with horizontal R&D overlaps, necessarily rest on the assumptions about the nature of future competitive interaction and about the process of creation of new knowledge and innovation. Both sets of assumptions may be difficult to verify. As a result, the assessment of innovation incentives will be inherently uncertain. This uncertainty should be factored into the assessment of mergers with non-horizontal R&D overlaps, which needs to be carried out comprehensively in a well-specified economic framework with clearly articulated and, to the extent possible, verified underlying assumptions.

It should also be kept in mind in the assessment that non-horizontal mergers have a considerable potential to boost innovation incentives without weakening product market price competition. Indeed, a vertical merger or a merger between complements may allow the merged firm to eliminate inefficient pricing externalities. This may lead simultaneously to lower prices and higher expected profitability for innovative products. This effect generally boosts innovation incentive.

A merger may also increase innovation incentives if R&D requires coordination between independent suppliers of innovative complementary products. Independent firms will often not fully internalize the positive externality from coordination, which results in free-riding problem and underinvestment. After the merger, the firm internalizes positive coordination externalities, increasing investments and eliminating free riding. Even if such a merger leads to worse terms of supply of inputs or information to remaining rivals, it will sometimes increase overall innovation and consumer welfare.¹⁴

IV. EFFICIENCIES

In a forward-looking dynamic assessment of a merger, the scope for merger-specific efficiencies is considerable. First, the merging firms may combine complementary R&D, equipment, IP, and researchers to increase productivity in innovation. ¹⁵ Cassiman et al. (2005) and Makri et al (2010), for example, find that complementary R&D knowledge can contribute to post-merger invention performance by stimulating higher quality and more novel inventions, provided that the acquirer has the capacity to assimilate and apply the acquired knowledge. ¹⁶

Second, the innovation incentive may increase if the merger improves the likelihood of a successful launch and market reach of a new product. Nascent and less experienced firms often face higher regulatory hurdles and other disadvantages from scale or network effects when bringing new products to the market or when introducing new business models. A merger with an established firm can help overcome these hurdles, increasing the expected incremental profits from a successful innovation and thus innovation incentive.

Third, when IP protection is weak or not available — i.e. in the presence of involuntary knowledge spillovers — the returns to investment in R&D cannot be fully appropriated. As a result, R&D investments are below what is socially optimal. All else being equal, the larger the involuntary spillovers between the merging firms, the more likely it is that the merger will improve the innovation incentive. Knowledge spillovers can take various forms, such as study of publications or technical meetings, reverse engineering, conversations with employees of innovating firm or through hiring employees from other firms. ¹⁷ It is notable that fear of knowledge leaks may also prevent efficient R&D collaboration between independent non-rival firms. ¹⁸

¹⁸ Besides IP, firms can use methods such as secrecy, lead time and learning curve advantages to limit the extent of involuntary spillovers, however these methods are not always effective.



¹³ In this context, it is notable that the likelihood of commercial success of R&D in the downstream arm of the merged company matters for the foreclosure incentive. When likelihood of success decreases, so do the incentives to engage in foreclosure. Indeed, if the merged company foreclosed R&D of a potential rival, but then failed to commercialize the own product in the downstream market, it would simply harm its future upstream business.

¹⁴ See, for example, Langus, G., V. Lipatov, & J. Padilla (2019): Non-horizontal mergers with investments into compatibility, CESifo Working paper 7617.

¹⁵ For example, in *TomTom/TeleAtlas*, the European Commission recognized the efficiencies due to integration of TomTom's data and Tele Atlas' map databases, concluding that the merger would likely bring "better maps – faster," COMP/M.4854 (paragraph 249)

¹⁶ Cassiman, B., M. Colombo, P. Garrone, and R. Veugelers (2005): The impact of M&A on the R&D process, Research Policy 34, 195-220; Makri, M., M. Hitt & P. Lane (2010): Complementary technologies, knowledge relatedness and invention outcomes in high technology mergers and acquisitions, Strategic Management Journal 31, 602-628.

¹⁷ See Levin, R.C. (1988): Appropriability, R&D Spending and Technological Performance, American Economic Review 78, 424-428.

Fourth, even if IP protection is available and strong, and involuntary spillovers are limited, markets for technology transfer through licensing may work poorly in some industries, particularly if the relevant knowledge is not easily codifiable, or if patents are vague. And even when IP rights are well defined, uncertainty about the value of technology in question and risks related to technology transfer may prevent efficient bargains from taking place. A merger may thus be the most efficient means for knowledge transfer.¹⁹

To avoid hampering innovation incentives, innovation efficiencies need to therefore be appropriately accounted for in the assessment of a merger. Cognizable efficiencies are merger-specific, verified and do not arise from anticompetitive reductions in output—and the burden of proof rests with the merging parties. ²⁰ Just as innovation theories of harm may often be uncertain, however, efficiencies may also be difficult to prove with a high degree of certainty. To avoid hampering competition, the standard of proof for efficiencies should be set at the same level as it is set for innovation theories of harm.

A factor that also needs to be considered when shaping merger review policy in innovative sectors, such as IT or pharma, is how a stricter antitrust stance towards mergers may affect the ability and incentive of firms to finance risky R&D projects. First, asymmetric information and resulting moral hazard are well-known issues in financial markets, particularly with respect to long-term, high risk (and potentially high-value) R&D investments that are often difficult to collateralize. As a result, markets for financing R&D activity may not function efficiently, exhibiting a "funding gap" for investment in innovation where the required rate of return by a firm investing its own funds is lower than the rate of return required by an external financier. ²¹ This means that the level of risky R&D investments will be lower than socially optimal. Acquisitions by an established firm with high cash flows or a high share of own capital in project financing may thus relieve a startup or a nascent firm's constraints in financing R&D, bringing the economy closer to social optimum.²²

Second, acquisitions are an important exit option for equity investors, particularly venture capitalists, in startups and nascent firms. Venture capitalists serve an important role in addressing the asymmetry of information by carefully scrutinizing firms before providing capital, staging capital infusion, and monitoring the firms' performance.²³ To the extent acquisition by an established firm is made considerably less likely by a stricter merger control in some industry sectors, the expected returns for venture capitalists will fall. As a result, they may provide fewer funds to startups investing in risky R&D.

V. CONCLUSION

To avoid hampering innovation, the effects of a merger should be assessed in a comprehensive analytical framework. Such framework specifies how firms make R&D investment decisions, how they finance R&D, how they innovate, and how they commercialize innovative products. Analysis of competitive interaction in future product markets with and without the merger is logically inseparable from the assessment of the merger's effect on innovation and should be an integral part of the comprehensive analytical framework for the analysis of innovation in merger review. The temptation to make the assessment appear more robust and certain by skipping any of these analytical elements should be avoided. Moreover, the standard of proof towards efficiency claims should be set at the same level as it is set for innovation theories of harm.

¹⁹ See Regibeau, P. & K. Rockett (2019): Mergers and innovation, The Antitrust Bulletin 64, 31-53.

²⁰ Horizontal Merger Guidelines (2010), U.S. Department of Justice and the Federal Trade Commission, p. 30.

²¹ See, e.g. Hall, B.& J. Lerner (2010): The Financing of R&D and Innovation, Handbook of the Economics of Innovation, Chapter 14.

²² Erel et al. (2016) evaluate more than 5000 European acquisitions between 2001 and 2009. They find that acquisitions improved access to capital for the acquired subsidiary, while investment increased following the acquisition. Erel, I., Y. Jang, & M. Weisbach (2016): Do Acquisitions Relieve Target Firms' Financial Constraints, Journal of Finance 70, 289-328. Although, Motta & Shelegia (2021) argue that the possibility of being acquired pushes the entrant towards developing and substitute rather than a complement, which can harm consumer welfare. Motta, M. & S. Shelegia (2021): The "Kill Zone": Copying, Acquisition and Start-Ups' Direction of Innovation, BSE Working Paper 1253. Cabral (2023) identifies a similar effect but warns that a stricter approach may harm startup innovation. Cabral, L (2023): Big Tech Acquisitions, CEPR Discussion Paper No. 18272.

²³ See Hall, B. & J. Lerner (2010): The Financing of R&D and Innovation, Handbook of the Economics of Innovation, Chapter 14.



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