



Texto para Discussão 031 | 2022

Discussion Paper 031 | 2022

Innovation Competition and Innovation Effects in Horizontal Mergers: US and European Selected Case Studies

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November, 2022

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Abstract

This paper discusses the assessment of negative innovation effects or innovation harm in horizontal mergers in the US and European Commission Merger Control. The goal is to investigate how the analysis of such effects has been undertaken, discussing the mechanisms used, the theories of harm and evidence applied. We review the theoretical principles that apply to innovation competition, as well as proposals for assessment taken by the literature. We then critically assess the US and EC experiences by looking at their past and recent experiences related to both their guidelines and case law. Finally, we undertake case studies connecting to the theoretical principles and the jurisdictions' experiences: (i) Takeda/Shire (EC – 2018); (ii) AbbVie/Allergan (EC – 2020); and (iii) Sabre/Farelogix (DoJ – 2019). We conclude that both jurisdictions have changed their assessment to address innovation competition to some extent, more in the case law than in the guidelines, but further improvements are needed.

Keywords: Competition Policy, Mergers, Innovation, United States, European Commission

JEL: L40

Resumo: Este artigo discute a avaliação de efeitos em inovação negativos ou dano à inovação em fusões horizontais no controle de fusões dos EUA e Comissão Europeia. O objetivo é investigar como a análise de tais efeitos foi realizada, discutindo os mecanismos utilizados, as teorias de dano e evidências utilizadas. Nós revisamos os princípios teóricos que se aplicam à concorrência em inovação, bem como propostas de avaliação retiradas da literatura. Em seguida, avaliamos de forma crítica as experiências dos EUA e Comissão Europeia ao analisar suas experiências passadas e recentes relacionadas aos seus guias e jurisprudência. Finalmente, realizamos estudos de caso conectando os princípios teóricos e experiência das jurisdições: (i) Takeda/Shire (CE – 2018); (ii) AbbVie/Allergan (CE – 2020); e (iii) Sabre/Farelogix (DoJ – 2019). Concluímos que ambas as jurisdições modificaram suas avaliações para endereçar concorrência em inovação até certo ponto, mais na jurisprudência do que nos guias, mas são necessárias melhorias adicionais.

Palavras-chave: Defesa da Concorrência, Fusões, Inovação, Estados Unidos, Comissão Europeia

1 Introduction¹

Competition is a multi-dimensional process. In other words, firms undertake efforts to offset its competitors through several variables, such as decreasing prices, increasing quantities, introducing product differentiation, improving the products' quality, and introducing innovations. The innovation dimension of competition can be called as innovation competition.

The notion of competing through innovation can be seen as a departure from a price-based static competition towards a more dynamic view of competition. Schumpeter (1942) considered that if on one hand competition has a passive static side, in which firms compete through prices, on the other hand competition has an active dynamic side, in which firms engage in innovation efforts to surpass their rivals. The contrast between the two sides of competition is often reflected in competition policy, especially when it comes to merger control.

The assessment of mergers by competition authorities has a well-defined procedure when it comes to traditional product market competition, i.e., cases in which the dimension of competition through price and within the market is the main one. When it comes to the assessment of innovation competition mergers and their potential effects on innovation, authorities have tried different approaches as merger control evolved, but although many advances have been made a standardized and consensual procedure is still to be found. The challenges begin in how innovation competition unfolds in each case: it is a diverse and heterogeneous process, and a unique procedure would not adequately capture harm to innovation in each case.

¹ This paper is one out of the three essays in the lead author's PhD dissertation. The lead author thanks CNPq for funding his PhD research. The authors would like to thank João Luiz Pondé, Eduardo Pontual Ribeiro, Julia Paranhos, Paulo Furquim de Azevedo and Vinicius Marques de Carvalho for the helpful comments.

Despite being a hard task, the US, and European jurisdictions² have changed their merger assessment both through official guidelines such as their Horizontal Merger Guidelines and in practice. The gradual changes to address innovation effects have been discussed by authors such as Gilbert & Tom (2001), Glader (2006), Katz & Shelanski (2007), Kerber & Kern (2014) and Kerber (2017) - for the US - and Glader (2006), Petit (2018b) and Chadha (2019) -for the EC. In this paper, we will take a step further by looking at how the assessments applied by the jurisdictions connect to the theoretical background of innovation competition - its basic principles - and assessment proposals taken from the literature, with a special look on both the gradual changes over time in these jurisdictions' merger control and recent cases.

The goal of this paper is to investigate how the assessment of negative innovation effects (or innovation harm) has been undertaken in both US agencies – The Federal Trade Commission and the Antitrust Division of the Department of Justice – and the European Commission, by looking at the mechanisms applied to assess these cases, as well as the theories of harm and the evidence usually applied. We first define the main theoretical principles applied to assess innovation competition and potential harm to innovation in horizontal mergers, and consider different propositions for assessing innovation effects in the antitrust literature– such as Gilbert & Sunshine (1995), Katz & Shelanski (2007), Federico, Scott Morton & Shapiro (2020) and Lyra & Pires-Alves (2022) - in order to critically assess how the agencies have analyzed innovation effects. Despite the important role of efficiencies in merger assessment, we focus our discussion in potential negative effects on innovation and the theories of harm to innovation to be potentially applied in horizontal mergers cases.³ At the end, we seek to provide recommendations for further improvements in the assessment by connecting conclusions taken from the theoretical background and the actual practice.

² In this paper, when we refer to the European or European Union jurisdiction or experience, we are specifically referring to the European Commission and not the national competition authorities within the European Union.

³ Innovation effects, negative innovation effects, harm to innovation will be used as synonyms. Another important disclaimer is that we are considering in this paper innovation efforts which result in vertical differentiation, i.e., new, or improved products which differ in terms of their quality.

The paper is organized in six sections. The next section discusses the theoretical aspects of innovation competition and harm in horizontal mergers, looking at both the main principles and concepts that guide these cases and the assessment proposals. The third section is dedicated to an overview of the evolution of the assessment of innovation competition cases in both jurisdictions. The fourth section presents an overview of the proposals taken from the literature and practice for assessing innovation effects. The fifth section presents the case studies in light of the theoretical and practical background presented in the previous sections. The sixth and final section presents the concluding remarks.

By the end, we find that innovation competition in horizontal mergers can be assessed through three different principles: business-stealing, capabilities, and dynamic effects. On one hand, the US Horizontal Merger Guidelines addresses innovation effects while its European counterpart does not, considering the role of innovation only in the assessment of price effects. On the other hand, the EC came up with a procedure in the case law which investigates different forms of innovation competition and applies the three principles to some extent. We conclude that despite the fact that neither of the guidelines presented a definitive procedure to address innovation effects, in the case law both jurisdictions applied different assessments dedicated to analyzing such outcomes, as corroborated by the case studies. Assessing innovation effects is a relevant concern, so we defend that jurisdictions need to be less timid on the subject and include proper assessment in their guidelines.

2 Innovation Competition and harm in horizontal mergers: theoretical aspects

The intrinsic complexity of innovation competition makes assessment harder when compared to traditional price/product competition. Considering how innovation and, therefore, innovation competition are not only complex but also heterogeneous, we need to discuss the theoretical aspects of these processes in the context of horizontal mergers

before we dive into the discussion on how jurisdictions assessed mergers in which innovation was at stake.

This section is divided in two subsections. We begin discussing the main principles and concepts of innovation competition in horizontal mergers, addressing the differences from product market competition and challenges for assessment. In the second subsection we discuss proposals for the assessment of these cases taken from the literature.

2.1 Innovation Competition in Horizontal Mergers: main challenges, principles, and concepts

When we look at innovation competition in horizontal merges, we are particularly interested in if and how the merger would affect innovation, i.e., whether there would be innovation effects and the extent of these effects. It is important to state that in this paper, we will look at potential post-merger lessening of innovation incentives as potential innovation effects. In this subsection, we discuss the concepts and principles that guide the evaluation of the impact of mergers on innovation incentives, mainly the business-stealing, capabilities, and dynamic effects principles, which are relevant to understand the challenges imposed to merger analyses in assessing innovation effects. This is especially important when we assume the heterogeneity of innovation competition among different markets and industries.

Structural factors, such as market concentration, play an important role as screenings in the widely accepted merger procedure for assessing the likelihood of price effects of mergers. Post-merger markets, if significantly more concentrated, are likely to present higher prices.⁴ So a first question when it comes to innovation would be whether the same

⁴ As mentioned in the 2010 US Horizontal Merger Guidelines, larger firms would be more reluctant in decreasing prices (Department of Justice, Federal Trade Commission, 2010, p. 15). However, it is worth mentioning that a deeper analysis of the competitive dynamics, including other factors beyond concentration, are the usual procedure in antitrust analyses (Department of Justice, Federal Trade Commission, 2010; European Commission, 2004b). Furthermore, as discussed further ahead, the role of concentration indexes as screening is weakened when product differentiation is at stake.

relation would work. The Arrow-Schumpeter controversy presents different views on the subject: Arrow (1962) considers that firms in perfect competition markets would have greater innovation incentives when compared to the other extreme on the concentration spectrum, monopolists. However, Schumpeter (1942) considered that large firms (and highly concentrated markets) would in a better position to innovate than small firms (and less concentrated markets). A proposition that combines both views is the inverted U hypothesis, presented by Scherer (1965): increases in concentration would be more conducive to innovation up to a certain point, after which further increases in concentration would reduce innovation. Even though there are empirical works testing different scenarios, no overall conclusion on the sign of the relation of concentration and innovation was found, especially one that would be applicable to several different markets.⁵

Even when innovation competition is not at stake, the role of structural factors in determining the overall effect in prices may be diminished when there is product differentiation. The jurisdictions usually look at other variables instead of concentration indexes, such as substitutability between products, diversion ratios and markup of diverted sales, as well as applying tools to assess unilateral price effects such as the GUPPI and UPP indexes.⁶ When we look at these factors, the analyst will give a greater emphasis on the effect of the merger on process of gaining sales and profit at the expense of the firms' rivals: whenever firms place a negative externality on each other which may be internalized in the merger, the process of diverting sales will be eased and, therefore, there will be less incentives to compete in price. The existence of a threat of losing sales to rivals is known as business-stealing effects (Federico, Scott Morton & Shapiro, 2020, p. 128). When it comes to innovation, a process analogous to the estimation of unilateral

⁵ Aghion et al (2005) presents the most relevant empirical work on the inverted U relation between innovation and concentration. Kerber & Kern (2014) provide an overview on the empirical literature. Among the limits to the applicability of the models are the number of hypotheses which they depend on (Kerber, 2017, p.7), the fact that they are not easy to estimate (Gilbert, 2006, p.191-200) and the great variability between sectors in many factors (Cohen, 2010, p. 194).

⁶ GUPPI and UPP are indexes which measure the pressure towards post-merger price increases. The first one considers only anticompetitive effects while the second one also considers countervailing efficiencies. Check Farrell & Shapiro (2010a), Farrell & Shapiro (2010b) and Salop & Moresi (2009).

price effects may be applied given the lack of a clear relation between structure and innovation.

The *business-stealing principle* is a broad notion which is not limited to price competition. Federico, Scott Morton & Shapiro (2020, p. 128) characterize business-stealing as the process of gaining and protecting sales from rivals by providing value to consumers through different means, including not only price, but innovation as well. So, the internalization of innovation-related business stealing effects, placed by the firms on each other through their innovation efforts (or existence of similar capabilities and lines of research as well, as we will discuss further ahead), would reduce innovation incentives, as innovation efforts towards one of the merging parties' products (previously owned by independent firm A) would cannibalize the firms' sales of the other product (previously owned by independent firm B), resulting in innovation effects. The closer (more substitutable) the firms' innovation efforts are, the higher the business-stealing effects are and, therefore, results in greater harm to innovation.

The assessment of innovation effects by a process analogous to the estimation of unilateral price effects can also be found in other previous works, with a similar mechanism to the business-stealing effects. Farrell & Shapiro (2010a, p. 33-34) propose the innovation diversion ratio, an index which captures the diversion of a firms' profit when a competitor innovates⁷, which may be an indicator of the extent of the business-stealing effects between the parties. Shapiro (2012), when studying the relation between competition and innovation lists three guiding principles. Similar to the business stealing concept, Shapiro's Contestability Principle⁸ defines that the perspective of gaining or protecting sales through greater value generates innovation incentives.

Furthermore, considering that whenever there is innovation-related business-stealing effects between firms, innovation competition is at stake, there are relevant situations

⁷ Formally, the authors define the innovation diversion ratio: "The innovation diversion ratio to Firm A from Firm B is the fraction $\frac{AB}{I}$ of the extra gross profits earned by Firm A when it devotes more resources to innovation that come at the expense of Firm B" (Farrell & Shapiro, 2010a, p.33).

⁸ The other two guiding principles are Appropriability and Synergy.

when innovation competition cases are not fully covered by the product market-oriented merger effect assessment, especially: (i) *when there is no product market yet* (e.g. parties are engaging in competing innovation efforts towards products which will create a new product market); or even (ii) when *there is a product market but at least one of the parties may be outside it* and engaging in innovation efforts to enter it (innovation competition itself occurs in different ways, as we will discuss in the next subsection).

In these cases, other elements from the traditional product market assessment are less applicable for assessing the likelihood of innovation effects, making the business stealing principle not enough to deal alone with four main challenges. First, in these situations, the traditional procedure to define relevant market, based on the Hypothetical Monopolist Test⁹, is either inadequate (no product market yet) or insufficient (there is a product market, but significant innovation efforts are being undertaken to enter the market by firms outside it, creating a perspective of significantly changing market structure). Second, although the assessment of competitive significance of product market cases is based on shares and concentration indexes such as the Herfindahl-Hirschman Index (HHI)¹⁰, for similar reasons as in relevant market definition, such measures are either not applicable (no product market case) or less relevant (there is a product market, but firms are still engaging in innovation efforts to enter it). Third, traditional merger assessment in product market focuses in short-run price effects, which is also either inadequate or insufficient for the same reasons as the two previous elements. Fourth, innovation may occur through different processes: through a linear process in which R&D generates a product or even in short innovation cycles as responses to customers' feedback, for

⁹ The Hypothetical Monopolist Test (HMT) is applied to define relevant markets. The authorities simulate a hypothetical monopoly and apply a small but significant non-transitory increase in price (SSNIP). If the SSNIP is profitable, the market is well defined (Department of Justice & Federal Trade Commission, 2010, p. 7-15). In the next subsection we will see that the Innovation Market Analysis proposal includes an alternative to market definition using R&D efforts in a similar way as the HMT.

¹⁰ The HHI is a concentration index which is the sum of the firms' shares squared, including all the firms in the relevant market. It is often presented multiplied by 10,000.

example.¹¹ A framework for assessing innovation competition in merger control should account for these specificities, even though, this may be a hard task.

To address the first two challenges identified we can add another element: firms' *capabilities principle*. A capabilities-based assessment considers that the firms' capabilities to innovate would influence: (i) relevant market definition, as when innovation competition is at stake, firms with both innovation efforts and capabilities to engage in competing efforts exert competitive pressure on the parties and should be included in the innovation market; (ii) the competitive significance of firms (merger parties and their rivals), since the extent of the firms' capabilities would work as indicators of their ability to compete through innovation.¹² In the next subsection, we discuss what we will call the capabilities-based assessment proposals.

Finally, the third challenge drives us to another principle that may be applied to a merger case when discussing innovation effects: the *dynamic effects principle*. This means that it is necessary not only to shift the assessment away from short run price effects, but also to consider the effects on innovation of a merger in different time horizons. A merger may result in harm to innovation in the short/middle run when a product development is interrupted as a result of a merger and in a long- and even unforeseeable-time horizon when innovation incentives related to a line of research is diminished and the likelihood of new innovation efforts in the future is lessened. As Kokkoris & Valletti (2020, p. 233-234) list, considering innovation effects as post-merger reductions in innovation

¹¹ In most writings on innovation and competition, innovation is considered as an output of R&D efforts, or in simple terms innovation as a result of R&D spending of a single firm. This relation of causation is considered in the linear model of innovation, more specifically the technology-push model, in which a firm makes a scientific discovery, incorporates it to its production and brings it to the market. According to Rothwell (1992, 1994), this model is considered as the first generation of industrial innovation, common in the 1950's and early 1960's. More recent models are non-linear and emphasize the role of other factors aside R&D spending, as the integration between R&D and manufacturing or marketing, interaction with suppliers, horizontal collaboration, among others. Rothwell's approach finds five different innovation models from the 1950's to the 1990's, with considerable changes between them. For more information check Rothwell (1992, 1994).

¹² There are some authors who suggest the use of capabilities in merger assessment, such as Gilbert & Sunshine (1995), Katz & Shelanski (2007), Sidak & Teece (2009), Kerber (2017).

incentives¹³, post-merger harm to innovation may occur through two channels. First, there may be less incentive to continue current product development, resulting in delaying and/or interrupting these innovation efforts. Second, incentives to begin new innovation efforts may be reduced, resulting in less innovation in the future.

2.2 Harm to innovation and assessment proposals: literature review

So far, we discussed the principles and concepts that may be applied to merger case analysis when innovation competition is at stake and the main challenges for assessing their potential effects on incentives to innovate. Different propositions to address innovation competition mergers can be found in the literature. This subsection presents some of these proposals.

Gilbert & Sunshine (1995) brings a new look on the subject not only from the theoretical side, but also influencing the assessment of innovation competition cases in the US. The authors name their proposition as the *Innovation Market Analysis* (IMA). As indicated by the name of the proposition itself, the IMA is based on defining innovation markets, understood as a *locus* of competition which occurs through innovation. It is important to note that Gilbert & Sunshine's methodology is focused on the effects of a merger on R&D specifically, and adapts the Hypothetical Monopolist Test to the context of R&D:

“In general terms, an innovation market is defined as a set of activities and a geographical area in which a hypothetical monopolist would impose at least a small but significant and nontransitory reduction in R&D effort” (Gilbert & Sunshine, 1995, p. 594).

¹³ Although we are only considering post-merger reductions in innovation incentives as innovation effects, it is worth mentioning that harm to innovation may occur through the elimination of parallel innovation efforts, as the maintenance of a greater number of distinct innovation efforts as it increases the probability that at least one of them reaches the market and is fundamental for preserving the role of the market as a selector of the most successful innovations. This argument, taken from the evolutionary approach is called as the Diversity Argument (Jorde & Teece, 1990; Farrell, 2006; Sidak & Teece, 2009). Furthermore, Farrell (2006) argues that a diversity of approaches is beneficial for competition on its own.

The authors present a step-by-step procedure with five phases. The first one is to identify overlapping R&D activities of the merging firms. Second, the analyst needs to identify alternative sources of R&D, i.e., substitutes close enough to constrain the exercise of market power. Here, the authors also include firms which could acquire the necessary assets for R&D in a short period of time. Third, assess the competitive pressure exerted by downstream incumbent and potential products. Fourth, the analyst must assess the effect of the merger in R&D. To do so, the authors suggest considering whether the merged firm's share of R&D is significant to the total R&D in that market and any other possible factor which could have an impact in competition.¹⁴ Finally, the last step is looking at possible R&D efficiencies which could increase the likelihood or value of innovation (Gilbert & Sunshine, 1995, p. 594-597).

By looking at the step-by-step procedure we can conclude that the IMA is a proposal for assessing innovation competition focused on pipelines. It presents advances in the assessment of innovation competition, shifting the focus of the assessment away from product markets and introducing a look on the firms' capabilities when looking for substitutes which could constrain the exercise of market power by the merged entity. We can say that the IMA is a first effort towards a capabilities-based assessment.

Despite its advances, the IMA was subject to criticism, as listed by Katz & Shelanski (2007) and Kerber & Kern (2014). First, some authors consider that such approach is not necessary, as there is the assessment of potential competition, which could consider innovation effects (Rapp, 1995; Hay, 1995) and future goods market analysis (Bernard, 2011). Second, critics emphasize the presumption of negative effects on innovation taken by the IMA (Rapp, 1995; Hay, 1995; Davis, 2003). Third, enforcement would be less predictable (Carlton, 1995). Fourth, effects on non-price variables would not have a legal basis (Hoerner, 1995, Davis, 2003). As we discuss deeper in the next section, the IMA influences the assessment undertaken by competition authorities.

¹⁴ The authors consider that the proper measure of the firms' share on innovation efforts will vary (e.g., expenditures in R&D or the level of activities and assets) (Gilbert & Sunshine, 1995, p. 597).

Some proposals are dedicated to list different scenarios of innovation competition and provide recommendations to assess innovation effects. Katz & Shelanski (2007) define *three canonical situations* as reference for assessment. First, when innovation is well underway to create or improve defined products and processes, firms are either product market competitors engaging in R&D efforts to improve their products in the market or are not competing in the product market yet but will do so in the future when the development of products for which they currently have R&D efforts being undertaken are finished. In this situation, competition is focused on the product market, however, when innovation efforts are well underway but are not completed and have not yet resulted in a tangible product, the innovation efforts may be used as evidence to characterize the firms as potential competitors. The focus of the assessment here is on traditional product market competition and not innovation. Second, when there is an innovation-based race to market dominance, i.e., competition is focused on the innovation efforts themselves and distant from the product market. Here, winner-take-all markets are examples presented by the authors: firms are engaging in competing innovation efforts to enter the market and the first one to complete product development becomes a monopolist (due to factors such as patent or network effects). As the post-innovation scenario is one of a monopoly in the product market, authorities must focus their assessment in preserving R&D competition and avoiding a reduction in innovation incentives which could delay market launch or results in a product with less benefits. Unlike the previous case, the focus of the assessment is in preserving innovation incentives, not conventional product/price effects (Katz & Shelanski, 2007, p. 64-66).

The two cases are considered by the authors as opposite ends on a continuum of possibilities, as the first one has no innovation concerns and is focused on the product market while the second is purely innovation-based. Many cases will be somewhere between those two canonical situations. The key to define the focus of assessment is how close the innovations are to market launch. In mergers in which the product is in its final stages of development and ready to enter the market the assessment will focus on traditional relevant market definition and concerns such as prices and quality. Cases in which the innovation is farther away from reaching the market, the assessment will focus on the likelihood and level of R&D efforts as measures of firms' capabilities (Katz & Shelanski, 2007, p. 64-66).

Finally, the third canonical situation refers to the specific case in which innovation is not protected from imitation or replication and a waiting game takes place instead of a race to reach the market, with all firms expecting their rivals to undertake innovation efforts to imitate shortly after. A merger presents a tradeoff for the authorities between static and dynamic factors, as approving it would internalize the free-riding problem but would concentrate the product market, resulting in static price effects while blocking the merger would maintain product market competition but keep the waiting game as it was (Katz & Shelanski, 2007, p. 66-67).

Based on the business-stealing effects principle, Federico, Scott Morton & Shapiro (2020) lists patterns of mergers which demand specific assessment. First, when there is an overlap which involves at least one pipeline project (either product-to-pipeline or pipeline-to-pipeline overlaps), the authors emphasize that enforcement is different depending on the stage of product development. Like Katz & Shelanski (2007), if the pipeline is close to market launch, the assessment should be undertaken focused on product market competition, as the results of innovation are tangible. Furthermore, if the pipeline still needs to be further developed and innovation incentives are needed, the assessment must preserve such incentives (Federico, Scott Morton & Shapiro, 2020, p. 138-146).

Second, if the parties have overlapping capabilities, they place business-stealing effects on each other related to new innovative efforts in similar areas. The merger internalizes such effects and may reduce innovation incentives to undertaken R&D efforts in the future (Federico, Scott Morton & Shapiro, 2020, p. 146-150).

The third pattern identified by the authors is less general than the previous two, discussing the specific cases in which a dominant firm acquires a smaller firm that has capabilities to innovate which could turn it into a threat to the dominant firms. This category is particularly directed to acquisition in digital markets, namely the ones in which the acquiree is a dominant platform such as Google, Facebook, Apple, and Microsoft. An acquisition may harm consumers through the loss of a competitive pressure to the dominant platform and the loss of an innovative product (Federico, Scott Morton & Shapiro, 2020, p. 150-153).

Finally, the faces of innovation competition is another proposal for the assessment of these cases (Lyra & Pires-Alves, 2022). This approach takes the proposals of Katz & Shelanski (2007) and Federico, Scott Morton & Shapiro (2020) as starting points, uses the: (i) business-stealing; (ii) capabilities; and (iii) dynamic effects principles to come up with a framework to assess innovation effects considering the different ways in which innovation competition occurs. In other words, this approach is based on the existence of innovation-related business-stealing effects: whenever firms place innovation-related business stealing effects on each other, innovation competition is at stake and mergers demand proper innovation effects assessment by the authorities. Furthermore, an effort is undertaken towards using a capabilities-based assessment when needed. Another feature of the approach is that it looks at possible innovation effects and its impact in welfare in different time horizons. Finally, this proposal also tries to account for the different ways in which innovation occurs, not limiting itself to the cases, for instance, in which it is developed through well-structured pipeline phases.

There are in this proposal three forms of innovation competition – the *faces of innovation competition* – which demand specific assessments. First, innovation may be at stake in competition between incumbents in the product market in which at least one of them constantly innovates as part of their strategy to gain market shares by improving their own products (mostly incremental innovations) – innovation competition through continuous innovation efforts in the product market. Here, we are not including innovation that occurs by the introduction of entirely new products or services, but continuous innovation efforts as part of the competitive strategy of a firm. Mergers may harm innovation not due to a possible delay or interruption of a specific innovation effort (such as a pipeline product) but through the elimination of a player which engages continuously in innovation efforts as part of its strategy. Rather than a specific product, potential harm is focused on the firms’ innovative behavior and the reduction of incentives for new innovation efforts in that specific product market, as in the second channel of innovation effects in Kokkoris & Valletti (2020). This face of innovation competition will apply only in industries in which the innovation not only does not follow strict pipeline phases but also occur in faster cycles such as smartphones and digital services. As competition is focused on the product market and the results of innovation are tangible, the standard definition of relevant product market is enough (following Katz

& Shelanski, 2007), however with a closer look on innovation effects related to the removal of an innovative competitor. The likelihood of innovation effects is directly connected to the size of the business-stealing effects between the parties' products. Some evidence to be considered can be summarized into two groups related to: (i) the extent of the business-stealing effects between the parties; and (ii) the competitive pressure exerted by rivals. We will list examples of evidence on these two groups in section 4. As the product market exists, the merger will also result in price effects, which should also be assessed (Lyra & Pires-Alves, 2022, p. 25-28).

The second face of innovation competition – innovation competition through ongoing innovation efforts for developing new products - applies to situations in which there are overlaps between ongoing innovation efforts or between an ongoing innovation effort and an incumbent product. Following Federico, Scott Morton & Shapiro (2020) it is called as product-to-pipeline and/or pipeline-to-pipeline overlaps, but instead it considers cases in which innovation does not occur through pipeline phases. The difference from the previous category is the focus of the assessment in protecting the incentives to innovate related to a specific product development, the first channel of innovation effects to innovation in Kokkoris & Valletti (2020), and not incentives related to new innovation efforts. The possible harm here occurs through the delay or interruption of that specific innovation effort, resulting in less competitive pressure, reduced variety, and less intense price competition in the future. The step-by-step procedure will vary according to how close to market the innovation effort is, following Katz & Shelanski (2007) and Federico, Scott Morton & Shapiro (2020). If the product is ready for market launch and no significant costs need to be spent to complete development, the assessment may be undertaken through the traditional product market competition assessment, as market launch is a matter of time, and the product may be considered as a potential competitor. In this situation, the competitive effects of the merger are the traditional product market ones as there is no risk of eliminating an innovation effort. When innovation efforts are still needed, a capabilities-based assessment is also required, including elements such as the innovation relevant market being defined with all the firms with the necessary capabilities to exert competitive pressure and the extent of those capabilities as an indicator of their competitive significance. In this situation, there is a possibility of innovation effects through the delay or interruption of the specific innovation effort. In

the case in which innovation incentives are needed to complete product development, important evidence for the assessment can be gathered into three groups related to: (i) the extent of the business-stealing effects between the parties; (ii) the competitive pressure exerted by rivals; and (iii) time to market launch, which will be further debated in section 4 (Lyra & Pires-Alves, 2022, p. 28-35).

This face may be subdivided in two different situations: when there is an existent product market and when there is not. When the product market is non-existent, i.e., there is a pipeline-to-pipeline overlap between products under development which will address a need not yet met by a marketed product, the authorities will have to address only innovation effects and undertake a capabilities-based assessment, as competition occurs only in the innovation market. When the product market exists, i.e., there is either a pipeline-to-pipeline between firms engaging in innovation efforts to enter a product market or a product-to-pipeline overlap between a firm with a marketed product and a firm engaging in innovation efforts to enter in that market, the authorities will address both innovation and price effects¹⁵ and consider both traditional and capabilities-based assessment to account for the role of both product and innovation markets (Lyra & Pires-Alves, 2022, p. 30-35).

The third face of innovation competition - innovation competition through future innovation efforts - is at stake when there is an overlap between innovation capabilities and lines of research. Regardless of whether the merging parties are engaging in product market, pipeline competition or neither, similar capabilities and lines of research are enough to place business-stealing effects on each other related to future innovation efforts, as firms are likely to engage in competing innovation efforts at some point. A merger in this situation would lead to a lessening of innovation incentives related to these lines or research. A capabilities-based assessment would also be applicable, as the innovation relevant market (similar to the innovation space concept above) includes all

¹⁵ When a merger potentially results in both price and innovation effects, Federico, Scott Morton & Shapiro (2020, p. 162-165) state that these effects interact and present models that simulate such interactions. In the literature, these effects interact differently depending on the model but Federico, Scott Morton, & Shapiro (2020) conclude that the general net effect of this interaction is harmful to consumers. Check also Jullien & Lefouili (2018) for a deeper discussion of this interaction.

firms with similar lines of research and capabilities. Harm would be a reduction of the merged entity's and rivals' incentives to undertake future innovation efforts due to the lessening of competitive pressure resulting in less innovation efforts in this line of research in the future (the first channel in Kokkoris & Valletti, 2020) for both the parties and their competitors. Besides looking for overlapping lines of research, evidence could be gathered to assess: (i) the extent of business-stealing effects between the parties and; (ii) to consider whether there is effective rivalry capable of exerting competitive pressure related to that line of research. In section 4 evidence will be further discussed. It is important to notice that in both Federico, Scott Morton & Shapiro (2020) and Lyra & Pires-Alves (2022) more than one pattern or face of innovation competition may be at stake in the same merger as multiple overlaps may occur. The authorities need to check the different possibilities of innovation effects and address them accordingly (Lyra & Pires-Alves, 2022, p. 35-39).

In this section we concluded that innovation competition in horizontal mergers can be analyzed by using three different principles: business-stealing, capabilities, and dynamic effects. The existence of innovation-related business-stealing between the parties indicates that innovation competition is at stake and allows the assessment of innovation effects in a process analogous to the estimation of unilateral price effects. The capabilities principle is helpful in situations in which the traditional step-by-step procedure is inadequate to assess innovation effects. By using a capabilities-based assessment, the authorities consider the parties' and rivals' capabilities to define the innovation relevant market and undertake the competitive assessment. The dynamic effects principle indicates that unlike in short-run price effects, when innovation is at stake the authorities need to investigate the effects of the mergers in multiple time horizons.

We also presented different proposals for the assessment of innovation effects, each one representing advances towards better addressing innovation competition cases. While the IMA (Gilbert & Sunshine, 1995) is an early pipeline-focused attempt of bringing capabilities elements into the analysis, Katz & Shelanski (2007) presents their canonical contributes by presenting two of their canonical cases as a continuum of possibilities in which innovation effects would be more or less relevant, showing that such effects may be at stake in different degrees depending on the specific case. Federico, Scott Morton &

Shapiro (2020) provide advances by applying the business-stealing principle to present three patterns of innovation competition which results in different possibilities of innovation effects. Furthermore, the faces of innovation competition framework (Lyra & Pires-Alves, 2022) is based on the business-stealing, capabilities, and dynamic effects principles; the proposition identifies three faces of innovation competition accounting for the specificities of each face to provide a framework for assessment addressing the three principles. Having discussed both the principles of innovation competition and the different assessment proposals, we now have the tools to critically investigate how the jurisdictions addressed in this paper - the US and the EU – have assessed innovation competition cases.

3 Innovation Competition and Harm assessment in US and European Horizontal Merger Control

Assessing mergers in which innovation plays a major role is as complex as innovation itself. As discussed in the previous section, innovation competition occurs in different ways and enforcement must consider the specificities of each situation to properly assess innovation effects. This is by no means an easy task and authorities have changed their step-by-step procedure in different opportunities. In this section we discuss the European and US experiences in the assessment of innovation effects in horizontal merger analysis, considering the literature review, jurisprudence, and guidelines.

3.1 USA

The different editions of the Horizontal Merger Guidelines show how the importance of dynamic aspects in merger assessment is increasingly higher. The 1992 edition brought the first dynamic aspects to the assessment where it is mentioned that the inquiry is forward-looking, therefore there is a relativization of the role of the historical market shares when there is a recent adoption of a new technology or when a new technology

adopted by a firm is not available to competitors (Department of Justice, Federal Trade Commission, 1992, p. 16; Glader, 2006, p. 68). The 1992 HMG is revised in 1997 and the role of efficiencies is changed. Among the possible outcomes of the existence of countervailing efficiencies is the advent of innovation, even though the agencies consider R&D-related efficiencies harder to assess (Department of Justice, Federal Trade Commission, 1997, p. 27-29; Glader, 2006, p. 68-69).

The 1995 Antitrust Guidelines for the Licensing of Intellectual Property included substantial improvements when it comes to assessing innovation in competition policy: it distinguishes the product, technology, and innovation markets. The latter is very similar to the definition of innovation market of the Innovation Market Analysis (Gilbert & Sunshine, 1995) and represented a shift from the assessment of innovation concerns in US antitrust (Kerber & Kern, 2014, p.17).

The case law reinforces the impression that the mid-90s were a turning point for the assessment of innovation in mergers. In the pharmaceutical sector, the acquisition of Genentech by Roche (FTC - 1990) may be considered representative of such inflexion, as it is not only one of the first cases to consider innovation effects, but also to consider an overlap between pipeline projects (Gilbert & Tom, 2001, p.53; Katz & Shelanski, 2007, p. 67-68). A few years later, after the advent of the innovation market concept, the assessment of innovation effects would rise substantially.

Gilbert & Tom (2001, p. 44) show that while in the first half of the 90s only four cases were challenged based on innovation concerns, in the second half of the decade forty-seven cases had innovation as a reason for challenging the operation (3% and 17.5% of total mergers challenged by the agencies, respectively). In the second half of the decade, more pharmaceutical mergers with pipeline-to-pipeline overlaps were assessed, such as Glaxo/Wellcome (FTC - 1995), Upjohn/Pharmacia (FTC – 1996), Baxter/Immuno (FTC – 1997), American Home Products (FTC – 1995) (p. 54). According to the authors, these cases would not have been assessed during the 1984 HMG regime, as the only cases involving parties without incumbent products that were considered as susceptible to

merger assessment were the ones in which an incumbent and a potential entrant got together, as in the potential competition doctrine.¹⁶

Innovation played a major role in the assessment of mergers in different sectors besides the pharmaceutical as well. The proposed (and later abandoned) acquisition of the Allison division of General Motors by ZF Friedrichshafen (DOJ - 1993) presented both price and innovation effects. About the latter, the merged entity would have controlled most of the global assets which are necessary for innovating in heavy duty trucks and bus transmissions. Sunshine (1994), emphasizes that the concern was not related to specific products but innovation in the whole line of research: “In this manner, our complaint captured the scope of the feared anticompetitive effect -- innovation over the entire line of heavy-duty truck and bus transmissions, not just those few product lines that had been the subject of direct sales competition in the past.” (Sunshine, 1994, p.3).¹⁷

Generally speaking, the post-1995 and pre-2010 HMG had relevant assessment of innovation concerns. Kerber & Kern (2014) find that in the 1995-2008 period, the US agencies considered innovation aspects in 34% of mergers.¹⁸ The 2000s had important innovation cases such as Pfizer/Warner-Lambert (FTC – 2000) and Genzyme/Novazyme (FTC – 2004),

The growing importance of innovation in the merger assessment is represented in the 2010 HMG. Although the Guidelines focus its assessment on product markets and not in innovation markets (Kerber, 2017, p.17), it includes elements such as briefly discussing the role of innovation in coordinated effects (Department of Justice, Federal Trade Commission, 2010, p. 26) and presenting a subsection entirely dedicated to assessing innovation aspects (section 6.4 – Innovation and Product Variety) in the unilateral effects

¹⁶ Roche/Genentech was an exception but was considered a potential competition case rather than an innovation market one (Gilbert & Tom, 2001, p. 53).

¹⁷ Other examples of non-pharmaceutical merger assessed on innovation grounds were Sensormatic/Knogo (FTC – 1995) and Lockheed/Northrop (DOJ – 1998). Check Gilbert & Tom (2001, p. 52), Glader (2006, p. 131-132), Katz & Shelanski (2007, p. 70-71).

¹⁸ The authors consider as innovation concerns when innovation play a role in either relevant market definition or competitive assessment.

section. The HMG divide innovation effects in two categories: (i) when at least one of the firms is engaging in innovation efforts which could capture sales from the other merging party and (ii) a longer-term effect related to the existence of capabilities to develop products in the future which could also capture sales from the other merging party (Department of Justice, Federal Trade Commission, 2010, p. 23-24). A few observations can be made. First, the business-stealing effects or Contestability mechanism is present here, as in both effects the source of harm is the removal of a competitive threat that could result in less innovation incentives. Shapiro (2010, p. 84) emphasizes how this mechanism is similar to the one applied when the HMG discusses unilateral effects regarding pricing of differentiated products and bargaining/auctions: focusing on diversion and cannibalization of profits.

Second, both categories express concerns presented in assessment proposals presented in the previous section. One is closely related to the pipeline overlaps in Federico, Scott Morton, and Shapiro (2020) and to the innovation competition through ongoing innovation efforts to develop new products category in Lyra & Pires-Alves (2022), as there is an overlap of ongoing innovation efforts with either innovation efforts or incumbent products. Furthermore, this concern goes also way back to the IMA. The other category is concerned with "...whether a merger will diminish innovation competition by combining two of a very small number of firms with the strongest capabilities to successfully innovate in a specific direction" (Department of Justice, Federal Trade Commission, 2010, p. 23). As seen, this is the capabilities overlap case and the innovation competition through future innovation efforts category in the faces of innovation competition framework. As discussed previously, there are cases which occurred before the publication of the 2010 HMG which assessed both innovation effects: mergers with pipeline overlaps and between parties with similar innovation capabilities. However, this edition of the guidelines makes such assessment clearer, even though it lacks a deeper discussion on the set of evidence necessary to support the theories of harm to innovation.¹⁹ We now turn to the European experience.

¹⁹ Under the new HMG, some important cases were assessed in the 2010s such as Nielsen/Arbitron (FTC – 2013) and Halliburton/Baker Hughes (DoJ – 2016).

3.2 European Union

3.2.1 Guidelines and pre-Dow/Dupont case law

The history of competition policy in the European Union goes way back to the Treaties of Paris (1951) and Rome (1957), but mergers and acquisitions were not assessed until the 1989 European Commission Merger Regulation (ECMR) (Motta, 2004). The latter does not present an explicit concern with innovation, apart from mentioning that the Commission would take into account the development of technical and economic progress (European Commission, 1989).

However, when it comes to innovation, Glader (2006, p. 75-79) lists some policy developments towards looking at innovation in the EU competition policy system before and after the 1989 ECMR, as the 1984 and 2000 R&D block exemptions²⁰ and, specially, the 2001 horizontal cooperation guidelines. The purpose of the latter is to provide the analytical principles and tools for the assessment of horizontal cooperation and brings important concepts which are related to the recent proposals for assessment presented in subsection 2. The EC not only mentions competition through innovation but distinguishes it from competition in existing markets (which are product and technology markets). The relevant market definition presents elements which are worth mentioning for our discussion, after all, according to Glader (2006, p.112) this guideline first introduced a clear definition of an innovation market in European competition policy. First, it mentions that “The key to defining the relevant market when assessing the effects of an R & D agreement is to identify those products, technologies or R & D efforts, that will act as a competitive constraint on the parties” (European Commission, 2001, p. 7). Recognizing that competitive constraint may come from different sources beyond incumbent products when innovation is at stake is a fundamental step towards assessing innovation effects considering the firm’s capabilities. Second, it does account for the different possibilities of innovation competition: (i) when discussing the product market, it considers cooperation concerning innovation efforts towards improvement of existing products,

²⁰ Following article 81 (3) of the European Commission Treaty, which discusses exemptions from the prohibitions of certain trade practices which, among others, contributes to promoting technical or economic progress. Check Glader (2006 p. 75-77).

emphasizing that when such improvements generate significant changes, old and new products belong in different relevant markets; (ii) includes the assessment of technology markets (markets for intellectual property); (iii) competition in R&D efforts (named ‘competition in innovation’ in the guidelines), towards developing a product which may replace existing ones or creating a new market. In this last case, assessment is considered to be different when, like in the pharmaceutical cases, innovation occurs through a well-structured R&D process (and the commission recommends assessing the case and taking a closer look at the existence of competing R&D poles) and when it does not (case which, absent exceptional circumstances, will not be assessed by the Commission). Finally, the guidelines also make some considerations on the assessment of firms’ market shares, mentioning that current shares may not be used as indicators when R&D efforts are directed to creating new markets (European Commission, 2001, p. 7-8).

When it comes to innovation specifically in merger control, we have to look at two documents published in 2004. The new ECMR is issued (European Commission, 2004a) along with specific guidelines for non-horizontal and horizontal mergers. Unlike in the 1989 ECMR, innovation is discussed in the Horizontal Merger Guidelines (European Commission, 2004b). First, the role of market shares as indicators of the competitive significance of mergers may be adjusted considering the context of the specific market, for instance when market structure is unstable due to innovation (European Commission, 2004b, p. 6). Second, when discussing unilateral effects (or non-coordinated, as in the guidelines) the HMG mentions that: (i) a merger may increase the incentive and ability to bring innovations to the market and (ii) a merger between innovators may impede effective competition (p. 9). This dual role of innovation presented in the HMG is a good illustration of the lack of a clear-cut relation between concentration and innovation mentioned in the previous section. Third, when discussing coordinated effects, the EC argues that in markets in which there is innovation, coordination may be more difficult as innovation allows the firm to gain a competitive advantage over its rivals (p. 10). Fourth, innovation and R&D may be a barrier to entry (p. 12). Fifth, when discussing possible countervailing efficiencies, the EC mentions efficiency gains in the field of R&D and innovation (p. 13). We can conclude that the European HMG, older than the current US HMG, does not directly discuss innovation effects, its principles, mechanisms, or the role of the firms’ capabilities in the assessment as its US present counterpart.

When we look the European Commission case law, cases in which innovation competition is discussed go way back to the mid-1990s (Petit, 2018b, p. 9), simultaneously with the wave of assessment of innovation concerns in the USA. Glader (2006) and Petit (2018b) list some of these cases.²¹

3.2.2 Dow/Dupont and the novel approach on innovation competition in EU Merger Control

It is impossible to debate the assessment of merger with innovation concerns in the European Commission without taking a while to discuss the Dow/Dupont merger (2017)²². This case represents such a major shift in the EU merger control that it makes sense divide the EU Merger Control experience in two parts: pre and post Dow/Dupont and we have discussed only the first one so far.²³ Todino, Walle, Stoican (2019) consider that there was a traditional approach to mergers with innovation concerns and a new approach which was gradually being developed in a series of merger cases up to Dow/Dupont. According to the authors, the traditional approach would assess mergers on innovation grounds only in cases involving late-stage pipelines, developed enough to be considered as potential competitors. The pipeline products would have to either: (i) already be exerting constraints on the incumbent's behavior or (ii) be likely to enter the market in a relatively short period of time and them constrain the rival's behavior. Furthermore, an insufficient number of rivals would also be needed for the merger to be considered as presenting anticompetitive effects (p. 5-6). Still according to the authors, three cases represent the gradual change on the traditional merger assessment in

²¹ In Pasteur-Mérieux/Merck (1994), Upjohn/Pharmacia (1995), Glaxo/Wellcome (1995), Ciba-Geigy/Sandoz (1996), Shell/Montecatini (1994), Crown Cork & Seal (1995), there were innovation concerns, the first four being from the pharmaceutical sector. With the arrival of the 2000s innovation concerns appeared in the case law before and after the publication of the 2004 ECMR and HMG, such as Pfizer/Pharmacia (2003), GlaxoWellcome/SmithKline Beecham (2004), Western Digital/Hitachi (2011), Deutsche Boerse/NYSE Euronext (2012), Medtronic/Covidien (2014), Pfizer/Hospira (2015), Novartis/GSK (2015), General Electric/Alstom (2015), J&J/Actelion (2017).

²² Case COMP/M. 7932 (EC 2017).

²³ Authors such as Denicolò & Polo (2018, p. 2), Jung & Sinclair (2019, p. 268), Kokkoris & Valletti (2020, p. 9) emphasize how Dow/Dupont (2017) represents a change in EU Merger Control.

innovation cases which led to the procedure applied in Dow/Dupont: Medtronic/Covidien (2014), Novartis/GlaxoSmithKline Oncology Business (2015) e Pfizer/Hospira (2015).

Dow/Dupont (2017) is the case in which the new approach is finally applied. This case represented such a shift to merger control that led to intense debate among academics, practitioners, and authorities.²⁴ This approach to the assessment of innovation effect is being referred as whether the merger results in Significant Impediment to Effective Innovation Competition (SIEIC), name based on the well-known Significant Impediment to Effective Competition (SIEC) test²⁵, applied by the Commission to check whether a specific operation would be anticompetitive. Other authors also call it as the innovation theory of harm (IToH) and the procedure itself would later be called by the EC as the four-layer competitive assessment in Bayer/Monsanto (2018) and AbbVie/Allergan (2020). To discuss SIEIC itself we first need to discuss Dow/Dupont (2017).

The Dow Chemical Company and E.I. du Pont de Nemours and Company were US-based diversified chemicals companies which announced a merger and notified the EC on 22 June 2016. On the assessment, the Commission identified four types of overlaps: (i) between incumbent products on many markets; (ii) between incumbent and potential competitors; (iii) between early pipeline projects and lines of research; (iv) between global R&D-integrated organizations. Here, we focus on the latter two as they discuss innovation concerns (the first two involve discussions on price and product competition) (European Commission, 2017, p. 34-35).

The focus of innovation concerns in this case is the crop protection business and the Commission finds that: (i) rivalry is an important driver of innovation in this market; (ii) Dow and Dupont hold lines of research and early pipeline products that would compete with each other if brought to market; (iii) they are close competitors; (iv) there are barriers

²⁴ Which led to a great number of publications either discussing this case specifically or its impact on EU Merger Control in general. We list here a few of them: Petit (2017, 2018a, 2018b), Denicolò & Polo (2018), Mosso (2018), Padilla (2019), Jung & Sinclair (2019), Chadha (2019), Seiler (2019), Kokkoris & Valletti (2020), Kokkoris (2020).

²⁵ For a discussion on the SIEIC test, check Petit (2018b, p. 5-7).

to entry and expansion at the level of discovery and development,;(v) only five integrated players acted in the whole value chain (discovery, development, mixture/formulation and commercialization), while other rivals do not possess similar capabilities and incentives (European Commission, 2017, p. 313-321).²⁶

To present the theories of harm to innovation, the Commission decides to look at possible overlaps in the different stages of product development, not only in pipeline stages but in previous steps as well, such as the discovery of new active ingredients. To do so, the EC uses the concept of innovation spaces - discovery targets pursued by the firms, so firms which compete over innovation spaces may be competing at the discovery and development stages, which precede pipeline phases – and finds the possibility of harm as the parties have many overlaps in developing products, early pipeline projects and lines of research which could divert revenue from each other. In Dow/Dupont, the Commission finds overlaps between the firms’ capabilities, lines of research and pipeline products and conclude that the reduced innovation efforts and capabilities to innovate would take the form of: (i) reduction of incentives to continue ongoing innovation efforts, possibly discontinuing, delaying, or redirecting early pipeline products and lines of research and (ii) reduced incentives to undertake future innovation efforts (European Commission, 2017, p. 322). The two channels of harm to innovation previously mentioned.²⁷

We can make a few comments on the assessment. First, business-stealing effects are at stake in the competitive assessment, as the competitive pressure exerted by the firms on each other plays an important role and there is closeness of competition between the parties. Also, the role of the diversion of sales in providing incentives to innovate is emphasized:

²⁶ The other three being Syngenta, Bayer, BASF (besides Dow and Dupont) (European Commission, 2017, p. 26).

²⁷ It worth noticing that the EC mentions not only post-merger reduced innovation efforts but reduced capabilities to innovate as post-merger harm to innovation. In this paper we focus our look on the reduction of innovation efforts. Anyway, both ways in which harm to innovation is mentioned in Dow/Dupont occur through the reduction of innovation incentives in the two channels presented by Kokkoris & Valletti (2020).

“The Commission further notes that its theory of harm rests on the broader notion of innovation competition rather than on the notion of cannibalisation of existing products. This is because cannibalisation is often meant to refer to a diversion of sales from one or several existing products to an innovative product sold by the same firm. Innovation competition, instead, more broadly refers to the extent to which innovative products of one firm may divert sales and profits from both existing and other innovative future products of rival firms. Through innovation, rival firms therefore impose a negative externality on each other. Accordingly, the Commission notes that even if innovation were to involve no cannibalisation of the sales of existing products, a merger between two out of a limited number of innovators in a market could reduce innovation incentives, by leading to the partial internalisation of the impact of innovation competition between the merging parties.” (European Commission, 2017, p. 335).

Second, the competitive significance of the parties and their rivals is measured by their capabilities in innovating. The proxies applied to assess such capabilities are patent shares and new active ingredients, which are indicators of the strength of those capabilities. We can conclude that the EC assessment is focused on the business-stealing effect mechanism as indicator of possible harm to innovation and the firm’s capabilities as indicators of the firms which can be included in the market the innovation spaces they compete into and their competitive significance. Furthermore, it is worth mentioning that the EC looked at internal documents from the parties as evidence to properly assess their capabilities.

The intense debate on Dow/Dupont is justified by the great shift it represents in EU merger control, the now called SIEIC. Chadha (2019, p. 4-5) argue that the European Union Merger Regulation (ECMR) (European Commission, 2004a) and the Horizontal Merger Guidelines (HMG) (European Commission, 2004b) set the roots for the SIEIC when they state: (i) that the notion of SIEIC should be applied to unilateral effects in the ECMR and (ii) that innovation effects should be assessed in merger control in the HMG. In fact, we could go even further and affirm that the SIEIC approach also follows the same mechanism applied to the assessment of unilateral price effects to some extent: the business-stealing effects, as the Dow/Dupont merger procedure made clear in the cannibalization debate. We can summarize the main features of the SIEIC approach: (i) extends the assessment of unilateral effects to innovation competition with a similar mechanism; (ii) changes the theory of cannibalization developed in Novartis/GSK

(2015)²⁸ to include diversion related to innovation efforts and future products instead of only existing products; (iii) expands the possibilities of overlaps to pre-pipeline stages by looking to competition in innovation spaces; (iv) assesses harm by looking at the effects of the merger on incentives related to ongoing innovation efforts and on incentives to innovate in the industry as a whole of the merging parties and its rivals; (v) looks at the firms' capabilities as a mean to identify rivals and assess the merging parties and their rivals' competitive significance.²⁹

Later, Bayer/Monsanto (2018)³⁰ and AbbVie/Allergan (2020)³¹ are cases in which SIEIC was also applied, confirming the shift in the way innovation cases are assessed in EU Merger Control. In these two cases, the procedure is now called as the four-layer competitive assessment. The basic premise of the procedure is the simultaneous assessment of product/price effects related to marketed products and late-stage pipeline products, as well as innovation effects related to pipeline products in earlier steps of development and the need to define the innovation spaces. If the Innovation Market Analysis (Gilbert & Sunshine, 1995) and Katz & Shelanski's (2007) approach extends the scope of the assessment from the product market to pipeline/R&D efforts competition, with the four-layer competitive assessment, the EC is investigating whether there are innovation effects related to the product market, competition between pipeline projects and competition over innovation spaces, broadening the scope of the assessment itself. When it comes to innovation effects, the EC looks at the delay or interruption of ongoing

²⁸ In GSK/Novartis (2015) an innovation effect assessed was the possible interruption of the development of Novartis' pipeline drug (European Commission, 2015a, p. 3-37). Todino, Walle, Stoican (2019, p. 9-10) argues that this case goes further away from the traditional one when it considers early-stage pipeline products and discusses harm to innovation in a broader level, i.e., mentioning incentives to innovation and innovation competition.

²⁹ Chadha (2019, p. 8-12) list some of the criticism towards the SIEIC approach: (i) not being robust enough to analyze dynamic factors; (ii) potential over-reliance on patent data; (iii) effectiveness of remedies such as the ones applied in Dow/Dupont (2017); (iv) failing to balance appropriability and cannibalization, (v) difficulties to satisfy the EC high standard of proof; (vi) asymmetry in addressing positive and negative innovation effects.

³⁰ Case COMP/M. 8084 (EC 2018).

³¹ Case COMP/M. 9461 (EC 2020).

innovation efforts as well as a general reduction of innovation incentives related in the industry, corresponding to the two channels of harm to innovation.

The name refers to the possibilities of horizontal effects checked by the EC: (i) product/price competition between incumbent products; (ii) product/price competition between actual and late-stage pipeline products or between late-stage pipeline products; (iii) innovation competition related to ongoing pipeline products, (iv) innovation competition related to incentives to innovate in the future (European Commission, 2019, p. 7-8). As mentioned in the previous section, given that innovation competition has different faces, the authorities need to investigate distinct possibilities of harm considering overlaps between the parties besides the ones in the product market. *AbbVie/Allergan* (2020) will be further discussed in the next section.

Before moving to the next section, we can make a few observations. First, the US 2010 HMG regime and the four-layer competitive assessment apply the business-stealing principles for assessing innovation in a similar way to what they did when it comes to price effects. Kokkoris & Valletti (2020, p. 224-225) list cases from both jurisdictions in which contestability/cannibalization concerns were present.³² Second, they also use the capabilities principle: the US 2010 HMG mentions a type of longer-term harm to innovation connected to the existence of specific capabilities while in the EC the four-layer competitive assessment apply a capabilities-based assessment. Third, both apply the dynamic effects principle when looking at effects in different time horizons. Fourth, Haucap (2017, p.16) mentions a difference between the two jurisdictions, as the US 2010 HMG only considers the effect of the merger in the merged entity's incentives to innovate and not in the competitors' incentives or in the industry's competition and innovation dynamics. Sixth, the US 2010 HMG discusses unilateral innovation effects, defining two possibilities of harm, but does not define a step-by-step procedure to assess innovation effects. Meanwhile, the 2004 European HMG only briefly discusses innovation without either defining harm to innovation or defining a procedure to be applied in practice. Fifth,

³² *Seagate/Samsung* (EU – Case COMP/M. 6214), *Western Digital/Viviti* (EU – Case COMP/M.6203), *Deutsche Boerse* (EU – Case COMP/M.6166), *Halliburton/Baker Hughes* (EU – Case COMP/M.7477), *Applied Materials/Tokyo Electron* (DoJ), *Dow/Dupont* (EU – Case COMP/M. 7932).

the debate on innovation effects in horizontal mergers seems to have two turning points: the mid-1990s, especially in the US and in the 2010s with new US 2010 HMG and recently with the four-layer competitive assessment in the EU. The latter shows that the EU produced its own procedure to address merger effects in the direct application to the case law, attempting to address different forms of innovation competition. Finally, despite being harder to predict, mergers with early-stage pipeline overlaps, as well as overlaps in capabilities, may have detrimental effects on innovation competition and may harm consumers. As presented by both the literature and the case law, assessing such effects is feasible and has been pursued by the authorities, although there is not an established procedure of how to assess them.

4 Innovation effects: an overview of the assessment propositions

Throughout the paper, we discussed different approaches for the assessment of innovation effects from both the literature and practice. Before we move to discuss selected cases in the next section, we need to summarize the different propositions to provide us the tools to critically assess such cases, emphasizing the similarities and differences between the approaches, grouping them, and unifying the evidence used to each type of innovation competition when it is possible.

We discussed five approaches to assess innovation effects in the previous sections: the Innovation Market Analysis (Gilbert & Sunshine, 1995), the three canonical cases (Katz & Shelanski, 2007), the four-layer competitive assessment (European Commission, 2017), the three patterns of innovation competition (Federico, Scott Morton & Shapiro, 2020) and the faces of innovation competition (Lyra & Pires-Alves, 2022). As these propositions address different forms of innovation competition, Table 2 associates them with the type of innovation competition they address.

Table 1 - Approaches to the assessment of Innovation Effects to innovation and the forms of innovation competition

Approach	Form of Innovation Competition		
	Within the product market through continuous innovation efforts	Through ongoing innovation efforts for developing new products	Through future innovation efforts
Gilbert & Sunshine (1995)			
Katz & Shelanski (2007)			
European Commission (2017)			
Federico, Scott Morton & Shapiro (2020)			
Lyra & Pires-Alves (2022)			

Source: own elaboration

Firms may engage continuously in innovation efforts to improve its marketed products. Authorities should be less concerned about the interruption of a specific product development and focus their gaze on the impact of the elimination of a firm which engages continuously in innovation efforts if the innovator places business-stealing effects on their competitors and such effects are internalized when the merger takes place. The reduced competitive pressure within the product market may result in less innovation incentives to begin new innovation efforts, the channel of innovation effects in this case. As stated, this merger may be assessed through the traditional assessment of innovation effect within a product market as firms are product market competitors. Evidence on the extent of the business-stealing effects between the parties can be: (i) the substitutability degree between the parties' products; (ii) current and expected profitability of diverted sales between the merging parties; (iii) the parties' history in bringing innovations in markets, (iv) whether the parties are frequent innovators or even innovation mavericks.³³ The latter two may also be applied to assess the competitive pressure exerted by rivals.

Innovation competition through ongoing innovation efforts for developing new products is discussed in the five proposals of assessment. This category addresses merger between firms engaging in competing innovation efforts -including when there is an innovation-

³³ Mavericks are firms which compete intensely in the market, making collusion harder. An innovation maverick is the specific case in which the aggressive behavior occurs through innovation efforts, i.e., the firm constantly offers new and/or improved products as its competitive strategy.

based race to market dominance, a situation in firms with competing R&D efforts engage in a dispute to reach the product market first (Katz & Shelanski, 2007). This implies the necessity of defining an innovation market considering their capabilities and of looking at how the merger impacts R&D (Gilbert and Sunshine, 1995). This scenario step away from using product market competition procedures towards the application of the capabilities principle.

The propositions to assess innovation competition through ongoing innovation efforts for developing new products cases apply the business-stealing, capabilities, and dynamic effects principles. A merger involving late-stage pipeline cases should be assessed only in price competition grounds as there is no risk of harm to innovation, while in cases in which pipeline products are in earlier stages the authorities should assess whether there could be a delay and/or interruption of innovation efforts due to less innovation incentives, the channel of innovation effects in this cases (European Commission, 2017; Federico, Scott Morton & Shapiro, 2020). The third layer in the four-layer competitive assessment is dedicated to the assessment of such cases, as well as the pipeline overlaps in Federico, Scott Morton & Shapiro (2020) and the second face of innovation competition - innovation competition through ongoing innovation efforts for developing new products in Lyra & Pires-Alves (2022). The latter also makes an effort to address cases in which innovation does not occur through well-defined pipeline stages. Both the four-layer competitive assessment and the faces of innovation competition typology make a greater effort to undertake a capabilities-based assessment when there is the possibility of harm to innovation, proposing identifying the firm in the innovation market and their competitive significance through the firms' capabilities. Federico, Scott Morton & Shapiro (2020) divide their analysis in product-to-pipeline and pipeline-to-pipeline overlaps, while in Lyra & Pires-Alves (2022), we discuss the difference between the situation in which the product market exists (case in which price effects should also be considered, as well as the interaction between the product and innovation markets) and when it does not.

When it comes to evidence, Federico, Scott Morton & Shapiro (2020) make suggestions, complemented by Lyra & Pires-Alves (2022), in which three groups of evidence should be looked at: related to the extent of the business-stealing effects between the parties, to

the competitive pressure exerted by rivals and to the time to market launch. The extent of business-stealing effects may be assessed by looking: (i) at the substitutability degree between the parties' products and also, for the cases in which there is an existent product market; (ii) evidence on current and future profitability of the incumbent product; (iii) expected duration of the overlap between the two products in the market; (iv) remaining time of patent protection. About the competitive pressure exerted by rivals and potential rivals we can look at: (i) the history of the parties in bringing innovations in the area; (ii) patent portfolios; (iii) durable barriers to entry; (iv) degree of cumulateness of innovative successes; (v) similar core capabilities and competences.³⁴ Time to market launch may be considered by checking evidence related to how developed the product is and will vary depending on the process of innovation in each industry.

The third form of innovation competition is at stake when the merging parties have overlaps in their capabilities and could, therefore, compete in innovation efforts in the future, making a merger harmful to innovation in a long- and unforeseeable-time horizon, a pattern addressed by the four-layer competitive assessment (European Commission, 2017), Federico, Scott Morton & Shapiro (2020) and Lyra & Pires-Alves (2022). The fourth layer of the four-layer competitive assessment is dedicated to check whether firms with overlaps in capabilities compete in certain innovation spaces, similar to the capabilities overlaps in Federico, Scott Morton & Shapiro (2020) and the innovation competition through future innovation efforts in Lyra & Pires-Alves (2022). All the propositions look at the business-stealing effects generated by the similarities of the firms' capabilities to innovate and lines of research, while emphasizing the use of elements from a capabilities-based assessment to undertake merger procedure. In Lyra & Pires-Alves (2022) we also discussed how, in this face of innovation competition, the authorities have to look for the possibility of harm to innovation in a longer and unforeseeable time horizon, as there may be a reduction in incentives to begin future innovation efforts, the channel of innovation effects in this form of innovation competition, in a long time period. Evidence for these cases may be divided into two

³⁴ As defined by Nelson (1991, p. 68), core capabilities in R&D are innovation efforts which the firms can viably engage. Core competences are similar, representing the skills and resources which make the firm idiosyncratic (Prahalad & Hamel, 1990, p. 4-6).

groups: (i): to assess the extent of business-stealing effects between the parties and (ii) whether there is effective rivalry capable of exerting competitive pressure related to that line of research. For both groups we can look at (i) the overlaps in capabilities and lines of research; (ii) history of the parties and competitors in bringing innovations in the area; (iii) past and current product and pipeline overlaps; (iv) patent portfolios; (v) durable barriers to entry; (vi) degree of cumulativeness of innovative successes; (vii) similar core capabilities and competences.

The five propositions bring contributions to the assessment of innovation competition cases, which we can gather into the three groups presented in this section. With such a division in mind, we can move to section 5 and look at how selected cases fit into these forms of innovation competition and discuss how the assessments were undertaken.

5 Selected Cases and Discussion

In the previous sections, we debated both the theoretical aspects of the assessment of innovation competition cases and the US and European Merger Control experiences. Given that we now have a theoretical and institutional background, we have enough tools to critically assess recent merger cases, decided after Dow/Dupont, in both jurisdictions. We selected, using the following criteria, cases that: (i) represent different industries; (ii) were not subject to simplified procedures when they were assessed by the authorities; (iii) present debates on innovation effects; (iv) represent different innovation processes and different innovation effects. We chose three case studies based on these criteria.

The first two are pharmaceutical cases assessed in the European Commission, both with innovation concerns regarding treatments for the same diseases. The first one was not assessed explicitly with the four-layer competitive assessment, while the second was. Both present concerns mainly related with pipeline projects, even though the first one represents a product-to-pipeline overlap with an existent product market and the second has a pipeline-to-pipeline overlap which potentially regards a non-existent product market. The third case was assessed by the US department of Justice in the sector of booking services to airlines. In this case, innovation does not occur in well-defined

pipeline phases, and the overlap is in the product market without any pipelines involved, a case of innovation competition within the product market through continuous innovation efforts and the concern here is the removal of an important innovator.

5.1. Takeda/Shire (EC - 2018)

In 2018, the Japanese Takeda Pharmaceutical Company Limited acquired Shire plc, an Irish-based pharmaceutical company.³⁵ Both are global companies, with similar size, with Takeda focusing on supplying treatments for Japan and developing countries and Shire targeting mainly the US market. While the main areas in which Takeda acts are oncology, gastroenterology, vaccines, neuroscience (being a major player in the first three), Shire is specialized in developing treatments for rare diseases (in fields such as immunology, hematology, neuroscience, gastroenterology, genetic diseases and ophthalmic) (European Commission, 2018, p. 2). There are two fields in which both companies act: neuroscience and gastroenterology, although the EC considers that the first one does not give rise to competitive concerns as both companies do not have marketed or pipeline products in the same disease areas.

When it comes to gastroenterology, some overlaps arise, specifically regarding treatments for: (i) inflammatory bowel diseases (IBDs) - including ulcerative colitis (UC) and Crohn's disease (CD); (ii) chronic idiopathic constipation (CIC); and (iii) esophagitis. The EC considers that the latter does not present competitive concerns as Takeda's incumbent products and Shire's pipeline project for the treatment of esophagitis are destined to different types of the disease and, therefore, would not belong to the same relevant market.

The treatment of UC and CD can be divided in three lines of treatment and the EC defines two relevant markets regarding the treatment of UC and DC in which the companies act:

³⁵ Case COMP/M. 8955 (EC 2018).

mesalazine (first line)³⁶ and anti-integrins (third line).^{37 38} It is important to add that the EC considered as rivals or potential rivals both firms with incumbent products and pipeline projects. There is a product-to-pipeline overlap (therefore a case in which there is innovation competition through ongoing innovation efforts for developing new products in an existent product market) between anti-integrins (a biologic considered as a third-line treatment)³⁹, once Takeda sells a drug called as Entyvio (vedolizumab) while Shire has a competing pipeline project (p. 3-11). Takeda's Entyvio has 100% share in this market definition in the EEA, as it is the only anti-integrin available. Meanwhile, there are two anti-integrins pipelines: besides Shire's, Roche is also developing a competing pipeline, both being in Phase III clinical trials.⁴⁰

The propositions studied in the last section state that the possibility of harm associated with innovation competition through ongoing innovation efforts for developing new products cases is the delay and/or interruption of product development as a result of less innovation incentives. Precisely, the EC concluded that the merger would result in harm to innovation as the merged entity would have incentives to discontinue or delay the

³⁶ There is a horizontal product overlap as both Takeda and Shire supply mesalazine, a first-line treatment in which there is no innovation concerns. The EC concluded that the merger would not result in anticompetitive effects in any of the geographical markets (European Commission 2018, p. 12-13).

³⁷ It is worth mentioning that the EC considers that biologics, the third-line treatments, could be further divided into three markets: (i) anti-TNFs; (ii) anti-integrins and (iii) IL inhibitors, as they have different modes of action. As the biologics marketed (Takeda) and being developed (Shire) and anti-integrins, the EC considered as the market for anti-integrins. The next case study, AbbVie/Allergan discusses the division of biologics into different relevant markets deeper.

³⁸ When it comes to the geographic dimension of market dimension, the EC emphasizes that it usually considers pharmaceuticals as nation-wide when they are incumbents and EEA-wide when they are pipeline projects and repeats this procedure in this merger assessment. Furthermore, regarding the treatment of CIC, the EC leaves the precise market definition open as it considers that the mergers would not be harmful regardless of how the market is defined

³⁹ Biologics, as well as innovative small molecules are denominated as post-conventional treatments in the next case study, AbbVie/Allergan.

⁴⁰ The three products (Takeda's Entyvio and the two pipeline projects) have different molecules, but the overall effect is similar (p. 13).

development of Shire's pipeline project, resulting in less variety and a lessening in price competition.

Innovation competition through ongoing innovation efforts for developing new products cases, as discussed, need to be assessed under three groups of evidence: the extent of the business-stealing effects between the merging parties, the extent of the competitive pressure exerted by rivals and time to market launch. The Commission studied three categories of evidence according to the first two of these three groups to conclude that harm would be likely. First, as anti-integrins are the closest competitors to one another due to their superior safety profile and Mode of Action (MoA), the EC considered such closeness of competition already a first indicator of important business-stealing effects generated by Shire's pipeline. Second, also due to its safety, there is not enough competitive pressure from adjacent markets. This statement is also supported by the lack of effect in Entyvio's pricing of the introduction of biosimilars to Remicade (while Remicade's price fell considerably) and the fact that Entyvio is bought through bilateral negotiations with hospitals and not through tenders (such as the anti-TNFs). Third, supporting the existence of high business-stealing effects between the parties, the merged entity is likely to discontinue or delay Shire's pipeline project as it would cannibalize Entyvio's sales due to the first two reasons mentioned and because it would be difficult to differentiate one from the other in the same portfolio (p. 14-17).⁴¹ The merger was approved subject to the divestiture of Shire's pipeline.⁴²

Despite not explicitly applying the four-layer competitive assessment, the basic mechanism, which is assessing both price and innovation competition with a special look at pipeline projects, was applied. Regarding price competition, the EC found a horizontal overlap in the product market for mesalazine, but no anticompetitive effects were

⁴¹ The EC also discusses the duration of Entyvio's patent protection, but the data is not available in the public version of the document (p. 17).

⁴² In May 2020, Takeda submitted a request to waive the divestiture of Shire's pipeline, due to: (i) the emergence of new drugs, with superior safety profile; (ii) some negative studies regarding Shire's pipeline and (iii) the management of the divestment business found difficulties in finding patients for the clinical trials. The request was accepted by the EC. Check: https://ec.europa.eu/commission/presscorner/detail/en/IP_20_967

identified (first layer). The focus of the assessment was on the innovation competition through ongoing innovation efforts, as there was a product pipeline overlap (not on late stage), which generated innovation effects.

Finally, the third form of innovation competition – innovation competition through future innovation efforts or the fourth layer in the four-layer competitive assessment - was not assessed. As both firms had similar capabilities and lines of research, the merger could result in diminishing innovation incentives related to future innovation efforts. It is impossible to precisely affirm that such effects would take place without further investigation, however in the next case study, AbbVie/Allergan (2020), the firms also present overlaps related to the treatment of UC and CD and the EC mentions that no innovation concerns arise in the fourth layer of assessment as there are many sufficient competing R&D at the global level, offsetting innovation effects on this layer.

It is important to recall that in the beginning of the assessment, the EC mentions that both companies act in the field of neuroscience, but no competitive assessment was undertaken as they do not have product or pipeline overlaps. Given that capabilities and lines of research may be similar, innovation competition through future innovation efforts could be assessed for the field of neuroscience even though there are no other overlaps. The lines of research for treatments of chronic idiopathic constipation (the parties have an overlap in the product market) and esophagitis (Takeda has an incumbent product and Shire has a pipeline, but there no overlap as they are directed to different types of the disease) also could have been assessed on the grounds of innovation competition through future innovation efforts on those lines of research. The fact that this form of innovation competition was not assessed in any line of research within neuroscience, or the lines of research of CIC and esophagitis may be an indicator that, when applying the four-layer competitive assessment, the fourth layer is only assessed when there are competition concerns in the second or third layers (which regards pipelines). Despite not looking at the third pattern of innovation competition and not applying the capabilities principle, the case undertakes an assessment based on the existence of business-stealing effects between the parties and actually checks possible harm related to the delay or interruption of a pipeline product.

5.2 AbbVie/Allergan (EC - 2020)

The acquisition of 100% of the shares of the Irish-based Allergan by the US-based AbbVie was signed on 25 June 2019. The two pharmaceutical companies work in multiple areas. AbbVie acts in the fields of immunology, oncology, virology, neuroscience/central nervous system disorders, metabolic diseases, and pain associated with endometriosis. Allergan acts in medical aesthetics, eye care, neuroscience/central nervous system disorders and gastroenterology (European Commission, 2020, p. 1-2).

The European Commission applied the four-layer competitive assessment procedure, previously adopted in Dow/Dupont (2017) and Bayer/Monsanto (2018), and presented in the last section. Unlike in Takeda/Shire, the EC explicitly mentioned the adoption of this procedure. So, they checked possible overlaps regarding:

- (i) price/product competition involving marketed products
- (ii) price/product competition involving late-stage pipeline projects (both product-pipeline and pipeline-pipeline overlaps)
- (iii) innovation competition involving pipeline products in earlier stages (which depend on innovation incentives to finish developing)
- (iv) innovation competition related to capabilities to innovate in certain innovation spaces (p. 5-6)

In this case study, we will discuss both innovation competition layers - the third and the fourth - related to innovation competition through ongoing innovation efforts for developing new products and through future innovation efforts, due to overlaps in capabilities. We will begin with the third layer.

There is innovation competition through ongoing innovation efforts for developing new products regarding treatments for inflammatory bowel diseases (as in Takeda/Shire,

includes ulcerative colitis – UC - and Crohn’s disease - CD)⁴³ (p. 6). The treatment for UC and CD can be divided into conventional and post-conventional treatments (applied when conventional treatments fail). Following the case law (including Takeda/Shire), the EC considered the two types of treatments as different relevant product markets.⁴⁴ As shown in Table 3, only Allergan had conventional treatment (so no competitive assessment is needed), while several overlaps appear when it comes to post conventional treatments. Furthermore, the EC presented a discussion on whether the post-conventional should further divided⁴⁵ but the precise definition was left open as in all three possibilities of relevant market, the merger would result in anticompetitive effects (p. 7-13). As in Takeda/Shire, firms with incumbent and pipeline projects were included in the relevant market definition.

⁴³ There is also ah horizontal product overlap in the treatment of uveitis but as the merging parties face a great number of competitors, there is no anticompetitive effects (European Commission, 2020, p. 21-23).

⁴⁴ Even though the EC follows Takeda/Shire to some extent, we discussed previously that the EC considered then three lines of treatments, with the first two being the conventional treatments in AbbVie/Allergan and the third, biologics, being the post-conventional treatments along with other innovative treatments.

⁴⁵ The discussion on the further division of the post-conventional treatments into different relevant markets was considered as depending on the Mode of Action (MoA) of the treatment. Three possibilities were assessed: (i) including all post-conventional treatments; (ii) including all post-conventional treatments excluding anti-TNFs; (iii) only IL-23 inhibitors. On one hand, all treatments compete with each other regardless of the MoA, while on the other hand, they are not fully substitutable and IL-23 inhibitors are considered as superior treatments Respondents to the EC Questionnaire considered the IL-23 inhibitors as superior in terms of efficacy, safety, sustainability of effects and speed of onset (European Commission, 2020, p. 12).

Table 2 - AbbVie and Allergan's incumbent and pipeline products for the treatment of UC and DC

	Product	Indication	Line of Treatment	Mode of Action	Status
AbbVie	Humira (adalimumab)	UC / CD	Post-conventional	anti-TNF (biologics)	Incumbent
	Skyrizy (risankizumab)	UC / CD	Post-conventional	IL-23 inhibitor (biologics)	Phase III
	Upadacitinib	UC / CD	Post-conventional	JAK inhibitor (innovative small molecule)	Phase III
	ABBV-323	UC	Post-conventional	CD40 antagonist (innovative small molecule)	Phase II
Allergan	Asacol (mesalazine)	UC / CD	Conventional	5-ASA	Incumbent
	Brazikumab	UC / CD	Post-conventional	IL-23 inhibitor (biologics)	Phase II (UC) Phase II/III (CD)
	ABI-M201	UC	Post-conventional	Microbiome biologic drug	Phase I

Source: European Commission, 2020, p. 8

Regarding the competitive assessment, the EC investigates the three possibilities of relevant market definition left open, checking whether there would be innovation effects. Regarding the narrowest one (only IL-23 inhibitors), no product had reached the product market by the time the merger was assessed by the EC. There were four pipeline projects in development, with two of them involved in the operation. So, in this market definition we would have a pipeline-to-pipeline overlap related to a still non-existent product market and we could consider the market as an innovation market composed by all the firms with pipeline projects towards the same MoA.

The EC focused its assessment on the existence and stage of development of the merging parties' and competitors pipeline products as the necessary evidence for presuming harm. As shown in Table 3, AbbVie's pipeline project was in Phase III clinical trials while Allergan's was in Phase II for the treatment of UC and Phase II/III for the treatment of

DC. Furthermore, there were only two rivals with competing pipeline projects: Eli Lilly (Phase III) and Johnson & Johnson (Phase II for treating UC and Phase III for treating CD). The EC highlighted that having a variety of products would not only result in higher price competition in the future but also that KOLs consider important to have a variety of option for treating patients. Finally, the EC concluded that the transaction would represent a risk of discontinuation of Allergan's pipeline product (brazikumab), the channel of innovation effect associated with innovation competition through ongoing innovation efforts for developing new products cases (p. 13-15).

By looking at the discussion undertaken by the EC, we can connect to the three groups of evidence for innovation competition through ongoing innovation efforts for developing new products cases: related to the extent of the business-stealing effects between the parties, as well as the competitive pressure exerted by rivals and to the time to market launch. First, we can assume that there were strong business-stealing effects among the merging parties as they were close competitors when it comes to substitutability of their treatments. Second, the firms had similar time to market, as they were in similar stages of development. Third, they notice that there were few rivals capable of imposing competitive pressure as despite most of the pipeline projects being in Phase III (including their rivals'), the EC mentions that the parties' internal documents show that all of them may not reach the market, meaning that innovation incentives are needed to finish product development and that the merger may result in harm to innovation (if market launch was imminent, harm would be related to the product market).

When the EC expands its analysis to all treatments for UC and DC excluding anti-TNFs (broadening the market definition), other pipeline-to-pipeline overlaps arise, as shown in Table 3. The EC argued that a possible discontinuation of Allergan's brazikumab would still represent harm in this market definition (p. 15-21).⁴⁶ The third and broadest market

⁴⁶ Such harm would still be likely as: (i) most of the pipeline projects in this market are related to existing MoAs and new alternative treatments are needed to cover different patients' need; (ii) IL-23 inhibitors are considered superior (as previously discussed); (iii) brazikumab would represent an important constraint to rivals, given that Allergan adopted a strategy to differentiate its product by conducting head-to-head trials comparing its efficacy with rival products, providing useful data and a competitive advantage. One of the rival products tested was Humira (AbbVie's marketed anti-TNF and market leader for post-conventional

definition deserves a few words, as another overlap arises between the merging parties. The category of this case would no longer be pipeline-to-pipeline overlaps towards a new product market, as the relevant market which include all post-conventional treatments is already existent. Besides the evidence already presented in the narrowest market definition, other are worth considering. First, regarding the extent of business-stealing effects, evidence on current and future profitability is presented in the merger procedure, as suggested by the literature for product-to-pipeline overlaps with an existent product market.⁴⁷ Second, the overlap in the product market post-brazikumab launch is expected to last as Humira is unlikely to leave the market given its market position. Third, the lack of patent protection of Humira would attenuate the business-stealing effects between the products, however, given the strength of the other evidence, we can conclude that they are high enough to give rise to concerns regarding a possible discontinuation of brazikumab.

So far, we discussed the competitive concerns related to innovation competition through ongoing innovation efforts for developing new products. The third form of innovation competition (through future innovation efforts) and fourth layer of the four-layer competitive assessment discusses innovation competition related to capabilities to innovate in certain innovation spaces. The EC only discusses this layer in a footnote and argues that there are many R&D competing at global level in the field of autoimmune diseases, the main source of overlaps in the merging parties' activities, mentioning a report which indicated that 150 companies were developing 311 medicines and vaccines

treatments), which is included in the broadest market definition (all post-conventional treatments), so there is also a product-to-pipeline overlap in this case. In that case the discontinuation of brazikumab is still harmful, as the head-to-head trials were conducted also to show that Allergan's promising pipeline project would be superior to Humira, exerting an important competitive constraint to the latter (European Commission, 2020, p. 15-21).

⁴⁷ Regarding Humira, even though shares began to drop as it lost its exclusivity in 2018 and biosimilars were launched, is still the market leader. Allergan's brazikumab, given its superiority, is expected to be profitable and, furthermore, divert some of Humira's profit (especially considering that the superiority to Humira was subject to the head-to-head test mentioned above). So, business-stealing effects are higher, the higher the profitability of the current sales that would be diverted to the innovation is.

for patients with autoimmune diseases in 2016 (p. 6).⁴⁸ In Dow/Dupont, the EC undertakes a much longer investigation on this layer, mainly due to the fact that there were only five global players on the field, unlike in AbbVie/Allergan. However, to reach this number of players capable of exerting competitive pressure, the EC looked into other R&D players in the crop protection business and, by investigating the whole R&D process, concluded that only the Big Five were integrated and capable of acting in the whole chain. In AbbVie/Allergan the high level of innovation efforts is considered enough to offset any risk of a possible reduction in overall innovation incentives in the industry, without a deeper investigation.

Even though the EC dedicated only a footnote to check a possible reduction in overall innovation incentives, we may undertake an exercise to check whether the innovation competition due to overlaps in capabilities category would indicate harm to innovation on that level. First, the EC considered the field of autoimmune diseases as a whole in this level of assessment, but one could ask whether this is too broad for an innovation market. Would it be true that a firm which has capabilities in developing a specific line of treatment exerts competitive pressure on other firm which has capabilities to develop another type of treatment? Second, if we were to consider a narrower innovation market, we would need to check which lines of research the firms act, by looking at their history in bringing innovation, as well as past and current pipeline overlaps. Currently we know about their ongoing overlaps in UC and CD treatment. Like Dow/Dupont, a closer look to the types of active ingredients and patents would be a good starting point to answer. Third, after defining the innovation market, we would need to check which of the rivals would conduct R&D in similar lines of research to check whether there would be competitive pressure to offset reduction in innovation incentives related to future innovation efforts. A conclusion we may take from this case, is an indicative that the fourth layer of the four-layer assessment, which investigates possible reductions in overall innovation incentives in the industry may be applied without looking deeper into the

⁴⁸ Interestingly, the EC mentions not only pharma and biotech companies, but also R&D undertaken in universities (p.6).

specific lines of research affected, in a way that does not capture reduction in innovation incentives when it comes to future innovation efforts.

Despite not going deeper in the assessment of the fourth layer, the EC applies the business-stealing principle and concludes that there is a potential interruption of a product development, i.e., negative innovation effects. The merger was approved subject to a full divestiture of Allergan's brazikumab pipeline (p. 25). AstraZeneca was the purchaser of the divested pipeline.

5.3 Sabre/Farelogix (DoJ - 2019)

In 2019, the US Department of Justice published a complaint regarding the proposed acquisition of Farelogix, Inc by Sabre Corporation, requesting that the US District Court for the District of Delaware blocked the acquisition. Both companies acted in the booking services to airlines market. While Sabre was the largest company in the market, Farelogix was a small but innovative player, threatening Sabre's position. As competition occurs within the product market, we can say that this case can fit the innovation competition within the product market through continuous innovation efforts category, given Farelogix's behavior in the market.

To discuss this market, we need to look on how the airline tickets are sold in the USA. Consumers may acquire tickets directly (online or through a call center) and through travel agencies (both online and traditional). The interaction between airlines and travel agencies is intermediated by the Global Distributions Systems, which provide the booking service through a software which allows the travel agencies to search and book flights through multiple airlines. The market is dominated by three GDS: Sabre (the leader), Amadeus and Travelport.⁴⁹ Farelogix is an innovative company which created the New

⁴⁹ As stated, Sabre is the largest, having over 50% shares on booking through traditional travel agencies (over 80% for large travel management companies) and over 50% for online travel agencies. The DoJ mentions that Sabre and the two other GDSs resist adopting new technologies and charge high prices to the airlines.

Distribution Capability (NDC), a next-generation technology. Based on the NDC, Farelogix also created the Open Connect system (OC). This innovation was groundbreaking for the market, as it allows the airline companies to offer a more personalized offer to the customer, such as priority boarding, internet, and snacks (Department of Justice, 2019, p. 3). Farelogix's innovation not only improved the quality of service offered to the final customer but was also used by airlines to negotiate lower prices with traditional GDSs.

The GDSs tried to use their market power to shut down Farelogix, as shown by Sabre's internal documents and reported by Farelogix⁵⁰ (p. 3-4). While such practices were successful in limiting Farelogix's growth when it comes to traditional travel agencies, the company was able to grow in the segment of online travel agencies (p. 11-12).

As competition occurs within the product market, DoJ undertook a traditional product market assessment. First it defined two product markets⁵¹ and no innovation markets were defined. Second, it looked at shares and concentration indexes, concluding that Farelogix has low market-shares, but the market has 3500 points in the HHI, which is considered very high, and acquisition would increase it in 350 points (p. 15-16). However, as it would be expected in this form of innovation competition, the DoJ also considers that the shares did not reflect the competitive significance of Farelogix, as the company is a disruptive player which not only was responsible for a downward pricing pressure but is also projected to increase its shares as the industry increasingly adopts NDC as standard technology. Furthermore, Farelogix led other companies to innovate. In 2017 Sabre began developing its own capabilities with a plan to surpass Farelogix in 2020, in case the acquisition failed.

⁵⁰ In 2013, Sabre requested that the US Department of Transportation blocked the use of NDC. Farelogix also claimed that Sabre pressured and retaliated airlines that adopted the company's services as in 2011, Sabre retaliated against American Airlines for adopting Farelogix's system by making its flights less visible to travel agents. Finally, the three GDSs contractually restricted the airline's ability to use cheaper and more advanced service (DoJ, 2019, p. 3-12).

⁵¹ The product markets defined were booking services for airline tickets sold through (i) traditional and (ii) online travel agencies. The geographical market was defined as the USA

The DoJ concluded that the acquisition would result in anticompetitive effects on both prices, quality, and innovation.⁵² When it comes to innovation effects, the DoJ listed the reasons why the acquisition would reduce innovation. First, Farelogix has been the driving force of innovation in the market, especially with the creation of NDC and OC. Second, the threat imposed by Farelogix was responsible for the adoption of NDC by Sabre and its investment in new technology. Third, Sabre plans to increase innovation efforts to catch up with Farelogix in case the merger does not happen. Fourth, Farelogix would also have incentives to keep investing in innovation in order to appropriate the gains from its innovation (p. 18-19). Summing up, we can say that the incentive to innovate of both companies arise from the business-stealing effects from the parties.

We can add other elements which signalize the presence of high business-stealing effects between the parties. First, their services are close substitutes. Second, Farelogix's innovation diverted sales from Sabre, pressuring prices down and increasing Sabre's innovation efforts. Third, the DoJ discusses that there is a perspective of intense growth in Farelogix's sales as the NDC becomes the industry standard. Fourth, the acquired firm has a recent history of bringing innovations in the market. Fourth, Farelogix has an innovation-intensive competitive strategy of going through innovation and considering how the traditional GDSs resist innovating and how Sabre was pushed to innovate due to Farelogix, we could even consider it as an innovation maverick.

When it comes to the competitive pressure placed by rivals, we can emphasize that Farelogix was the only firm engaging in innovation efforts when it developed NDC and its innovation efforts are the reason which its rivals (Sabre, at least) engage in innovation,

⁵² Regarding the price and quality effects, the DoJ: (i) reinforced the Farelogix's role in decreasing fare; (ii) presented statements and messages from executives which mentioned that the acquisition would allow prices to go up; (iii) stated that Sabre would have increased market power on the online travel agencies market, which was eroded by Farelogix (p. 17). As Sabre would have significant increase in market power, the DoJ also emphasized that US full-service airlines would be particularly harmed by the transaction as: (i) a great part of their revenue comes from sales made through travel agencies; (ii) their booking needs are more complex than other airlines; (iii) business travelers are important customers to those airlines, which make them especially dependent on travel agencies.

so there is no external rivalry in innovate which could offset the innovation effects arising from this merger.

The innovation competition through continuous innovation efforts category is concerned with the withdrawal of a firm which engages in innovation efforts continuously. Even though the complaint is focused on the impact of the introduction of a particular innovation (NDC) in the market, the DoJ emphasizes how the introduction of the NDC pushed Sabre to engage in innovation efforts and how Farelogix would also have incentives to keep innovating to appropriate the gains from its innovation. In that sense, the removal of Farelogix generates precisely the innovation effect which this category is concerned: the reduction in incentives to begin new innovation efforts.

Besides presenting anticompetitive effects, the DoJ argued that there are significant barriers to entry in this market, such as: (i) technical difficulties and time to create an integrated IT system using NDC and (ii) contracting practices by the traditional GDSs to avoid that airlines look for new services. The DoJ also states that Farelogix invested over 100 million dollars to develop its solutions and persisted for 15 years to become a competitive threat to Sabre. Finally, the transaction would not result in merger-specific efficiencies (p. 19). As a result of significant anticompetitive effects, high barriers to entry and no efficiencies, the DoJ announced that it would seek to block the transaction.

The assessment of Sabre/Farelogix mostly followed the first form of innovation competition by undertaking a product market assessment, but with the presence of innovation diminishing the role of shares and concentration indexes. Although not explicitly, the business-stealing effects were applied and innovation effects were considered as in the second channel of innovation effects, resulting in possible reduction in innovation incentives to begin new innovation efforts.

6 Concluding Remarks

The inadequate assessment of innovation competition in mergers may result in reductions in innovation incentives which could be avoided. Such innovation effects may harm not only the market at stake, but the development of economies as a whole. Despite its importance, the assessment of innovation competition horizontal mergers is a challenge for jurisdictions around the globe. The characteristics of innovation, an inherently diverse process which is also subject to uncertainty, makes the proper assessment harder as the traditional approach to product market cases have limited applicability.

The US agencies and the European Commission undertook efforts to improve their procedures, increasingly changing their guidelines and the way they assess these cases. When it comes to the Horizontal Merger Guidelines themselves, the 2004 European one does not address innovation effects, while the 2010 US version has a subsection dedicated entirely to unilateral innovation effects, based on the business-stealing and dynamic effects principles. The two HMG do not set a procedure specifically designed for the assessment of these effects. However, the European Commission introduced a new procedure in Dow/Dupont (2017) – the four-layer competitive assessment - applied to other cases as well, which address innovation competition including not only the business-stealing and dynamic effects principle but also elements from a capabilities-based assessment.

We concluded that the propositions for assessing innovation effects may be grouped into three forms – innovation competition through continuous innovation efforts, through ongoing innovation efforts for developing new products and through future innovation efforts. By grouping into forms of innovation competition we can recognize similarities between the proposals, identifying similar groups of cases and principles applied by different authors. We were also able to group suggestions for evidence, which can be helpful for changing the guidelines applied by the jurisdictions. Each of these patterns need to be addressed differently and innovation effects may take place through different channels.

As seen, the case studies shows that the case law provides us examples of the assessment of innovation effects in mergers with different characteristics which can be associated to

the different patterns of innovation competition. We can draw a few conclusions from them. First, given that the EC applied explicitly the four-layer competitive assessment in AbbVie/Allergan (2020), but not in Takeda/Shire (2018) despite the fact both mergers addressed similar treatments, the four-layer competitive assessment seems to be applied still with caution by the EC. Takeda/Shire was addressed earlier than AbbVie/Allergan, but its notification took place almost a year after Dow/Dupont (2017) was decided. Second, in both cases, the assessment of innovation competition through future innovation efforts is still timid, given that the EC only investigated it in one of the two cases (AbbVie/Allergan) and did it briefly, without going further than discarding it for the number of players with similar capabilities. Although a high number of players indicates the existence of competitive pressure, further investigation would be important, as the authorities need to check the specific lines of research in which the players act and the extent of post-merger rivalry in those lines. The lack of appropriate assessment on this form of innovation competition shows that harm to innovation in a long- and unforeseeable-time horizon is still a minor issue for the assessment. A proper application of the dynamic effects principle includes looking at harm in multiple time horizons. Third, the focus on innovation competition through ongoing innovation efforts shows that much of the focus of the EC on innovation effects is centered on the possible delay or interruption of pipeline projects. Fourth, the US jurisdictions, the DoJ at least, is concerned with the innovation competition within the product market, as it sought to block an acquisition which would eliminate a continuous innovator in the market. It properly addressed innovation competition through continuous innovation efforts in the product market, by applying traditional procedure for a product market competition assessment but with a closer look on innovation and not only price effects. Fifth, in all the cases the business-stealing principle is applied and is directly connected to the evidence used in the cases showing that it plays a major role in the assessment. Finally, the capabilities principle still needs to be further as it did not play a major role in the assessment of these cases.

The three cases show that not only both agencies sought to change their guidelines and procedures, but also that innovation effects are being considered in cases with different faces of innovation competition. However, the three agencies still have some ground to cover, especially when it comes to the assessment of overlaps in capabilities and the

effects of mergers in future innovation efforts. As recommendations of research agenda, we can suggest: (i) new case studies need to be done regarding recent cases in these agencies to properly investigate how innovation competition assessment is evolving; (ii) a deeper empirical exercise is also needed to investigate whether and how innovation effects are being increasingly assessed and the final results to innovation; (iii) look at similar movements towards assessing innovation competition in other jurisdictions; and (iv) changing the Horizontal Merger Guidelines towards better addressing innovation competition cases, considering the specificities of each case.

References

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

Arrow, K. (1962). Economic welfare and the allocation of resources for invention. In: . Princeton, Princeton University Press p. 609-626. 1962. In N. B. Research, *The rate and direction of inventive activity: Economic and social factors* (pp. 609-626). Princeton: Princeton University Press.

Bernard, K. (2011). Innovation market theory and practice: An analysis and proposal for reform. *Competition Policy International*, 7(1), 159-198.

Carlton, D. W. (1995). *Testimony Before the Federal Trade Commission Hearings on Global and Innovation-based Competition: Antitrust Policy Toward Mergers When Firms Innovate: Should Antitrust Recognize the Doctrine of Innovation Markets*. Retrieved from <http://www.ftc.gov/opp/global/carlton.htm>

Chadha, M. (2019). Innovation Competition in EU Merger Control and Its Evolution in DOW/DuPont. *SSRN Electronic Journal*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3417572

Cohen, W. M. (2010). Fifty Years of Empirical Studies of Innovative Activity and Performance. In B. H. Hall, & N. Rosenberg, *Handbook of the Economics of Innovation - Volume 1*. Amsterdam: North-Holland.

Davis, R. W. (2003). Innovation Markets and Merger Enforcement: Current Practice in Perspective. *Antitrust Law Journal*, 71(2), 677-703.

Denicolò, V., & Polo, M. (2018). The innovation theory of harm: An Appraisal. *Working Paper Series - Università Bocconi*, 103.

Department of Justice & Federal Trade Commission. (1992). 1992 Merger Guidelines. Retrieved from [justice.gov/sites/default/files/atr/legacy/2007/07/11/11250.pdf](https://www.justice.gov/sites/default/files/atr/legacy/2007/07/11/11250.pdf)

Department of Justice & Federal Trade Commission. (1997). *1997 Merger Guidelines*. Retrieved from <https://www.justice.gov/sites/default/files/atr/legacy/2007/07/11/11251.pdf>

Department of Justice & Federal Trade Commission. (2010). *Horizontal Merger Guidelines*. Retrieved from <https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf>

Department of Justice. (2019). *Complaint - Case 1:99-mc-09999*.

European Commission. (2001). *Guidelines on the applicability of Article 81 of the EC Treaty to horizontal cooperation agreements*. Retrieved from [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001Y0106\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001Y0106(01)&from=EN)

European Commission. (2004a). *Council Regulation (EC) No 139/2004 of January 20, 2004 on the control of concentrations between undertakings*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004R0139&from=EN>

European Commission. (2004b). *Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings*. Retrieved from [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52004XC0205\(02\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52004XC0205(02)&from=EN)

European Commission. (2017). *Case No COMP/M.7932 - Merger Procedure*. Retrieved from https://ec.europa.eu/competition/mergers/cases/decisions/m7932_13668_3.pdf

European Commission. (2018). *Case No COMP/M.8955 - Merger Procedure*. Retrieved from https://ec.europa.eu/competition/mergers/cases/decisions/m8955_1868_3.pdf

European Commission. (2020). *Case No COMP/M.9461 - Merger Procedure*. Retrieved from https://ec.europa.eu/competition/mergers/cases/decisions/m9461_1187_3.pdf

Farrell, J. (2006). Complexity, Diversity, and Antitrust. *The Antitrust Bulletin*, 51(1), 165-173.

Farrell, J., & Shapiro, C. (2010a). Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition, 10 *The B.E. Journal of Theoretical Economics* 1., *The B.E. Journal of Theoretical Economics*, 10(1), 1-41.

Farrell, J., & Shapiro, C. (2010b). Upward Pricing Pressure in Horizontal Merger Analysis: Reply to Epstein and Rubinfeld. *The B.E. Journal of Theoretical Economics*, 10(1).

Federico, G., Scott Morton, F., & Shapiro, C. (2020). Antitrust and Innovation: Welcoming and Protecting Disruption. *Innovation Policy and the Economy*, 20, pp. 125-190.

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

Gilbert, R. J., & Sunshine, S. C. (1995). Incorporating dynamic efficiency concerns in merger analysis: the use of innovation markets. *Antitrust Law Journal*, 63(2), 569–601.

Gilbert, R. J., & Tom, W. K. (2001). Is Innovation King at the Antitrust Agencies? The Intellectual Property Guidelines Five Years Later. *Antitrust Law Journal*, 69(1), 43-86.

Haucap, J. (2017). Merger effects on innovation: A rationale for stricter merger control? *Concurrences*, 4-2017, 16-21.

Hay, G. A. (1995). Innovations in Antitrust Enforcement. *Antitrust Law Journal*, 64(1), 7-17.

Hoerner, R. J. (1995). Innovation Markets: New Wine in Old Bottles? *Antitrust Law Journal*, 64(1), 49-73.

Jorde, T. M., & Teece, D. J. (1990). Innovation and cooperation: implications for competition and antitrust. *Journal of Economic Perspectives*, 4(3), 75-96.

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

Jung, N., & Sinclair, E. (2019). Innovation theories of harm in merger control: plugging a perceived enforcement gap in anticipation of more far-reaching reforms? *European Competition Law Review*, 40(6), 266-275.

Katz, M. L., & Shelanski, H. A. (2007). Mergers and Innovation. *Antitrust Law Journal*, 75(1), 1-85.

Kerber, W. (2017). Competition, innovation, and competition law: Dissecting the interplay. *Joint Discussion Paper Series in Economics*(42-2017). Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3051103

Kerber, W., & Kern, B. R. (2014). Assessing Innovation Effects in US Merger Policy: Theory, Practice, Recent Discussions, and Perspectives. *SSRN Eletronic Journal*.

Kokkoris, I. (2020). Innovation considerations in merger control and unilateral conduct enforcement. *Journal of Antitrust Enforcement*, 8(1), 56-85.

Kokkoris, I., & Valletti, T. (2020). Innovation Considerations in Horizontal Merger Control. *Journal of Competition Law and Economics*, 16(2), 220-261.

Lyra, M. P., & Pires-Alves, C. C. (2022). Three Faces of Innovation Competition in Horizontal Mergers: choosing the framework for Competition Policy Assessment. *IE/UFRJ Discussion Paper*, 008/2022. Retrieved from: https://www.ie.ufrj.br/images/IE/TDS/2022/TD_IE_008_2022_LYRA_PIRES-ALVES.pdf

Mosso, C. E. (2018). *Innovation in EU Merger Control*. Remarks prepared for the 66th ABA Section of Antitrust Law Spring Meeting, Washington.

Motta, M. (2004). *Competition Policy: Theory and Practice*. New York: Cambridge University Press.

Nelson, R. R. (1991). Why do firms differ, and how does it matter? *Strategic Management Journal*, 12, 61-74.

- Padilla, J. (2019). Revisiting the Horizontal Mergers and Innovation Policy Debate. *Journal of European Competition Law & Practice*, 10(7), 463-471.
- Petit, N. (2018a). "Innovation competition and merger policy: New? Not sure. Robust? Not quite!". *Concurrences*, 2-2018.
- Petit, N. (2018b). Innovation Competition, Unilateral Effects and Merger Control Policy. *ICLE Antitrust & Consumer Protection Research Program White Paper*.
- Prahalad, C. K., & Hamel, G. (1990). The Core Competence of the Corporation. *Harvard Business Review*, 90(3), 79-91.
- Rapp, R. T. (1995). The Misapplication of the Innovation Market Approach to Merger Analysis. *Antitrust Law Journal*, 64(1), 19-47.
- Rothwell, R. (1992). Successful industrial innovation: critical factors for the 1990s. *R&D Management*, 22(3), 221-239.
- Rothwell, R. (1994). Towards the Fifth-generation Innovation Process. *International Marketing Review*, 11(1), 7-31.
- Salop, S. C., & Moresi, S. (2009). Updating the Merger Guidelines: Comments. 1662. Retrieved from https://www.ftc.gov/sites/default/files/documents/public_comments/horizontal-merger-guidelines-review-project-545095-00032/545095-00032.pdf
- Scherer, F. M. (1965). Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions. *The American Economic Review*, 55(5), 1097-1125.
- Schumpeter, J. (2008). *Capitalism, Socialism and Democracy*. New York: Harper Perennial Modern Thought.
- Seiler, M. (2019). *Innovation Competition in EU Merger Control*.

Shapiro, C. (2010). The 2010 Horizontal Merger Guidelines: from hedgehog to fox in forty years. *Antitrust Law Journal*, 77(1), 49-107.

Shapiro, C. (2012). Competition and Innovation Did Arrow Hit the Bull's Eye? In J. Lerner, & S. Stern, *The Rate and Direction of Inventive Activity Revisited* (pp. 361-404). Chicago: University of Chicago Press.

Sidak, G. J., & Teece, D. J. (2009). Dynamic competition in antitrust law. *Journal of Competition Law and Economics*, 5(4), 581-631.

Sunshine, S. C. (1994). Initiatives in Merger and Joint Ventures Analysis. Retrieved from <https://www.justice.gov/atr/file/519486/download>

Todino, M., Walle, G. v., & Stoican, L. (2019). EU Merger Control and Harm to Innovation—A Long Walk to Freedom (from the Chains of Causation). *The Antitrust Bulletin*, 64(1), 11-30.