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Innovation competition in horizontal mergers: choosing the framework for Competition Policy assessment

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abstract: This article discusses the assessment of horizontal mergers and harm to innovation when there is innovation competition. The goal is to build a scheme for the proper choice of the framework of analysis, presenting, for each situation: mechanisms to identify innovation competition, to undertake market definition, to assess the competitive significance of firms, identification of the appropriate theories of harm and evidence. We review the literature on Competition Policy and on Economics of Innovation and take examples from the US and European case law. We also briefly discuss the strategic management literature to provide insights for the assessment. Considering post-merger reductions on innovation incentives as harm to innovation, we find differences of traditional merger procedure adequacy and challenges to build evidence, considering three faces of innovation, including possible combinations of these faces within a same merger case: (i) incremental innovation efforts in the product market, (ii) ongoing efforts for developing new products and (iii) future innovation efforts. When the traditional merger procedure is inadequate, we argue in favor of using a capabilities-based assessment, changing the step-by-step procedure.

keywords: Competition Policy, Mergers, Innovation, Capabilities

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1. Introduction³

Preserving post-merger innovation is a relevant concern for competition policy.⁴ Even though the proper assessment of the effects of mergers on innovation is intuitively important, the debate on the potential negative effects of mergers on innovation⁵ is still open and the authorities have not reached a consistent and consensual approach.⁶ These inconsistencies may be partially explained by the fact that the conventional approach, and the competitive model generally applied in merger review considers static analysis and price effect as the main representation of merger impacts on markets, influencing the views and interpretations applied to merger analysis' procedures (such as relevant market definition, barriers to entry, anticompetitive effects, among others). However, there are markets in which competition occurs through different variables, such as innovation, and the conventional approach is inadequate to assess such cases in some situations (Budzinski, 2008).

Following Schumpeter's seminal ideas (Schumpeter, 1942), in some industries, competition occurs mostly through innovation, dynamically, and in an active, instead of passive, way. By definition, there are innovation effects when there is innovation competition, i.e., firms compete through innovation efforts to bring new or improved goods or services to the market as well as better production processes to both capture away and protect sales from each other (the active side of competition in a Schumpeterian view) (Federico, 2017). Innovation effects occur through the lessening of innovation incentives and reduction of parallel research efforts.⁷ The understanding how mergers change the incentives to innovate is the main call on the literature – represented by the contributions of the contestability, appropriability, and synergies principles in Shapiro (2012), the typologies of cases where these effects are applied in Baker (2007), and the internalization of a “business-stealing effect”, in Federico, Scott Morton & Shapiro (2020). It is important to notice that firms which compete through innovation often compete simultaneously on other variables as well, such as prices and quantity. Despite the inconsistent practice, the relevance of innovation appears in important contributions about its role in merger control. Authors such as Gilbert & Sunshine (1995), Katz & Shelanski (2007), Sidak & Teece (2009) and Kerber (2017) call for the application of an alternative assessment, changes in the conventional merger procedure to adapt it to innovation competition markets, suggesting an assessment based mainly in the firms' capabilities to innovate. For these authors, the capabilities of the firms should be considered in market definition and in the assessment of competitive significance as a better way to identify competitors and as proxies of the firms' ability to innovate.

In the practical side, despite the inconsistent assessment of innovation in the US case law, there

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⁴ Diminishing innovation is regarded as a possible harm resulting from horizontal mergers in different jurisdictions, such as in the USA, European Commission and Brazil (Department of Justice; Federal Trade Commission, 2010, p. 2; European Commission, 2004, p. 5; CADE, 2016, p. 8).

⁵ Innovation effects are possible reductions on innovation as a result of mergers.

⁶ In USA, as pointed by Kerber & Kern (2014), assessing innovation effects in mergers is a well-established but inconsistent practice, although it does not mean that the subject was ignored. In 34% of the cases innovation aspects were mentioned either in market definition or competitive assessment. Gilbert & Greene (2015) make a similar study for 2004-2014 and find similar results (33.6%). The inconsistency of the assessment of innovation effects argued by Kerber & Kern (2014) lies on the conclusion that despite the number of cases in which innovation concerns were raised, in most of them there was no specific reasoning for the alleged effects on innovation, it is just mentioned. Gilbert & Greene (2015) find that among the cases in which there are innovation concerns, the effects on innovation are discussed and not only mentioned between 46% and 58% of the cases (depending on the level of R&D intensity) in the USA.

⁷ The maintenance of distinct parallel innovation paths is fundamental for keeping the role of the market as the selector of the most successful innovator and for the welfare of consumers. As the results of innovation are uncertain, the higher the number of innovation paths, the higher the chance that any of them actually reaches the market. Besides, according to Farrell (2006), diversity of approaches is a benefit of competition in itself and should be protected by the authorities. So, mergers may harm innovation also through the reduction in parallel innovation efforts. This argument comes from the evolutionary approach and may be known as the Diversity Argument (Jorde & Teece, 1990; Farrell, 2006; Sidak & Teece, 2009). Kerber & Kern (2014) find out that among the cases challenged with innovation aspects (between 1995-2008), in 33% of them there was a discussion of the effects of mergers on innovation incentives and in 7% of them there were diversity arguments.

are some advances towards the consideration of innovation aspects in the merger procedures for innovative markets can be observed since mid-1990s with the introduction of the innovation market concept and innovation effects in the agency guidelines.⁸ The latest version of the Horizontal Merger Guidelines (2010) also explicitly states procedures for the assessment of innovation effects (Department of Justice; Federal Trade Commission, 2010, pp. 24-31). The European Commission also moved towards the assessment of innovation effects in the past few decades.⁹ Recently, the Dow/Dupont merger (2017)¹⁰ presented a significantly different approach called by Denicolò & Polo (2018) as the Innovation Theory of Harm (IToH) (Petit, 2017; Denicolò & Polo, 2018) and indicated concerns about the previous steps of the development of a product and the merger consequences to the incentives to undertake future innovation efforts.¹¹

This paper's central goal is to build a scheme for the proper choice of the analytical framework to be applied to the assessment of horizontal mergers¹² in which there is innovation competition, focusing on the understanding of the possible theories of harm, and the different ways that innovation may occur – the faces of innovation competition - and their consequences to the analysis in each case. We work on premise that negative innovation effects should be addressed both when traditional competition and innovation competition are at stake simultaneously and when there is only innovation competition. Furthermore, we also assume that protecting innovation incentives is a key attribution of competition policy, as innovation negative effects are likely to harm consumers and the competitive process itself, and that it needs to assess the different time horizons in which it occurs, considering short- and long-term impacts of mergers. The paper is also devoted to look at the likelihood of negative effects on innovation, although we recognize that efficiencies should be addressed to have a complete picture of the overall effect on innovation of each case. To achieve its goals, we review the literature in competition policy and innovation mainly for merger effects on incentives to innovate and the contributions to innovation market definition and competitive assessment, including the ones referenced before. We also review business literature and alternative firm's theory to understand the capabilities to innovate of a firm. Cases are used to exemplify along the text.

Three methodological choices are important to be noted before we proceed. Firstly, although the paper aims at horizontal concerns, we also include the effects of conglomerate mergers, as they may also generate horizontal concerns in some cases.¹³ Second, product innovation is the focus of our analysis, even though process innovation is an important topic of discussion. Third, by assuming that R&D spending is not the only necessary input to bring innovation to the market and that its importance to innovation varies between sectors, but by knowing its advantage of being much simpler, we will follow the literature and use R&D efforts and their developments (pipelines), in some situations, but will also offer alternatives for assessing cases in which innovation does not occur through pipeline phases.

This paper is structured as follows: section 2 discusses market definition and the assessment of competitive significance both in traditional and innovation competition, presenting the conventional approach to merger assessment, its features and limitations when applied to innovation competition, as well as presenting an alternative approach, the capabilities-based assessment. Section 3 debates innovation incentives and theories of harm to innovation, emphasizing the role of business-stealing effect in identifying possible negative effects to innovation through reductions on innovation incentives. Section 4 presents the three faces of innovation competition, discussing its features, type of assessment, specificities on how merger affects innovation incentives, the theories of harm and evidences, while using cases to exemplify. The Section 5 deepens on the capabilities-based assessment, providing insights taken from strategic management literature and from an alternative theory of the firm to fill gaps identified throughout the text and discusses the challenges of practical application. The final section

⁸ The 1992 version of the Horizontal Merger Guidelines presented no discussion of innovation. The 1995 version of the Antitrust Guidelines for the Licensing of Intellectual Property describes the R&D market in a similar way to what Gilbert & Sunshine (1995) proposed, the Innovation Market Analysis (IMA) (Kerber & Kern, 2014).

⁹ See list of EC cases in Petit (2018).

¹⁰ Case COMP/M.7932 (2017).

¹¹ Bayer/Monsanto (2018, Case COMP/M.8084) is also assessed under a similar framework, confirming the shift in European merger control.

¹² Non-horizontal innovation concerns are also important but are not in the scope of this paper.

¹³ This may be especially relevant in the digital sector, platform and competition along an ecosystem.

presents the proposed scheme and the concluding remarks.

As we will present in the paper, the identified merger cases in which there may be harm to innovation, by reducing the firms or the entire market's incentives to innovate are when there are: (i) incremental innovation efforts in the product market, (ii) ongoing efforts for developing new products and (iii) future innovation efforts. These situations represent different faces of innovation competition and demand specific assessments and type of evidence. As we will show, these cases are not mutually exclusive and can be assessed in the same merger analysis. We also conclude that the capabilities-based assessment is a relevant framework for some cases. Incremental innovation and innovation competition through ongoing innovation efforts for developing new products that are not close to market launch may follow the traditional approach although the difficulties of differentiated products and the innovation effects are still a remaining challenge. We find that contributions from the resource-based approach provide important insights for the assessment of these cases, especially when there is no well-structured R&D process and when it regards future innovation efforts. Although there is still a long path ahead for the proper assessment of innovation competition cases, we propose a framework in a systematic way as a final contribution of this paper.

2. Traditional and innovation competition: market definition and the assessment of competitive significance

The assumptions about how competition works interfere in an agency's concerns about a merger effect and its decision. When it comes to the real-world practice some of the theoretical basis and models may not be a good representation of the market. This is the case when innovation is an important attribute or even the drive of competition. This section is devoted to briefly discussing both traditional competition and innovation competition views, how the Post-Chicago¹⁴ (henceforth called "conventional approach") assesses such cases and its limitations when addressing the latter.

2.1 The traditional competition and conventional approach to merger analysis

When undertaking merger analysis of traditional competition cases, the competition authority assess competition that occurs within a product market (which is not necessarily the case when discussing innovation competition). The assessment counterbalances the potential anticompetitive effects and efficiencies. In other words, if the net effect of a merger in consumer's welfare is negative¹⁵, the competition authority will approve it subject to remedies¹⁶ or even block the entire merger. The fundamental questions that arise are: what are the likely effects of a merger and how to assess them? To answer that, we must bear in mind that preserving welfare is the goal of competition policy. And to achieve it, authorities pursue economic efficiency to avoid welfare losses.

The concept of static economic efficiency can be divided into different concepts, the most well-known being productive and allocative efficiency (Motta, 2004; Price & Walker, 2016, p. 475). The first one is achieved when the use of inputs is at the optimal level for a given output. The second one is achieved when there is no deadweight loss, i.e., when price is at competitive levels. So, increases in prices represent allocative inefficiencies, i.e., creation of deadweight losses. If prices are alleged to be higher after the merger due to the increase in market power derived by the operation, the latter is considered to be anticompetitive. The price increases may occur unilaterally or in a coordinated basis, considering horizontal mergers. The changes in the short run price are then considered the main variable to represent merger effects by the conventional approach, despite also considering a variety of goals, such as product quality and innovation.¹⁷

To estimate these effects, many different quantitative tools may be used if necessary, most considering the assumptions of the classic oligopoly models (Bertrand or Cournot competition). Furthermore, the use of models focused on short-run price effects and the important role of structural

¹⁴ The Post-Chicago paradigm, which is the basis for competition policy analysis in most jurisdictions contains influences from the Harvard and Chicago Schools. For more on this debate, see Budzinski (2008, p. 298-301).

¹⁵ See Motta (2004).

¹⁶ Competition policy remedies are conditions imposed by the authority to approve a merger.

¹⁷ Other possible mergers effects are reductions in output, choice, and quality (European Commission, 2004, p. 5).

factors implies that competition occurs mostly within the product market. The conventional approach presents a well-defined merger procedure to be taken before deciding about the merger potential effect, including: (i) market definition; (ii) measurement of market shares and market concentration (indicating the existence and increase of market power, but also the competitive significance of the merging parties and their rivals); (iii) assessment on the likelihood of anticompetitive effects (unilaterally and/or through coordinated behavior); (iv) entry and buying power; (iv) evaluation of possible countervailing efficiencies (European Commission, 2004; Department of Justice; Federal Trade Commission, 2010).

In these cases, the relevant market is the locus of competition, and to define it, the authorities must delimitate its product and geographical dimensions.¹⁸ After defining the relevant market, authorities usually assess market shares and market concentration as a screening part of the analysis to indicate the competitive significance of the merging parties and their rivals and the direct effect of the merger on concentration (European Commission, 2004, p. 6-7; Department of Justice; Federal Trade Commission, 2010, p. 15-19). In cases in which there is traditional competition, concentration and market share are used as indicatives of firms' incentive to raise prices (decrease quantity, or lower quality) and of their ability to compete. Larger firms may be less willing to decrease prices of all of their costumers to attract new customers. Also, larger market shares may represent advantages on cost or more attractive products in other attributes than price (Department of Justice; Federal Trade Commission, 2010, p. 15-19). However, this relation is weakened when products are differentiated, in which substitutability between merging parties' products or brands, deviation rates and markups may be more relevant as screening to price increase pressures than the resulting market share and concentration index.^{19 20}

2.2 Innovation competition, conventional approach limitations and the capabilities approach

The use of the conventional approach to merger assessment may offset other possible merger effects, such as innovation. The role of innovation in the competitive process is best described by Schumpeter (1942), who understood competition as being a dynamic process centered on innovation. For the author's conception, there is an active dimension of competition, in which new opportunities to innovate are sought and created and the firm always seeks to differentiate itself so that it can obtain monopoly gains. Unlike the passive price dimension of competition, Schumpeter argues that this is not a stationary process as in perfect competition - it is a process of changing the economic structure endogenously, the Process of Creative Destruction (Schumpeter, 1942). Furthermore, the Schumpeterian Competition framework understands that the competitive process permanently generates diversity and changes to market structure, and that competition occurs through different variables, so that price is just one of them, other ones being product differentiation and, specially, innovation (Schumpeter, 2008, p. 81-86; Sidak & Teece, 2009, p. 40-41). This last form of competition, in which firms compete to bring new or improved products or processes, is called innovation competition.²¹ It is important to notice that while traditional competition occurs necessarily only within a product market, innovation competition occurs whenever firms compete through innovation efforts, being product market competitors (or within a product market), or not.

¹⁸ The most common method to define the relevant market is the Hypothetical Monopolist Test (HMT). If the hypothetical monopolist is not capable of implementing a small but significant non-transitory increase in price (SSNIP) in a profitable way, the market is well defined (Department of Justice; Federal Trade Commission, 2010, p. 7-15).

¹⁹ Unlike the case of homogeneous products, in which there is a direct connection between market power and shares derived from the Cournot model and the HHI, when there are differentiated products, diverted sales are a better indicative of these effects (Department of Justice; Federal Trade Commission, 2010, p.21).

²⁰ Also, in rapid changing markets, market-shares can be volatile, as sales can be highly contestable by possible future entrants.

²¹ Schumpeter considers the active side of competition as the "...competition for the new commodity, the new technology, the new source of supply, the new type of organization..." (Schumpeter, 2008, p. 84). We consider a definition of innovation competition in the same direction as Schumpeter pointed out. Considering a more recent approach, we follow Federico (2017, p. 671) who sees innovation competition as a process of rivalry through innovation efforts to bring new or improved goods or services to the market as well as better production processes to both capture away and protect sales from each other.

Innovation competition is at stake in different situations, and the possible different faces that it can assume is further discussed in section 4. For now, we can think of two hypothetical examples. In the first one, firms compete in the product market through prices or quantities while engaging on innovation efforts to improve its product to capture sales from its competitors (incremental innovation). In the second example, firms are engaging in a race through innovation efforts to develop new products which will be competitors in a still non-existent product market and their pipeline projects are not close to market launch. In the first case, innovation competition occurs simultaneously with traditional competition (or within a product market), while in the second one competition occurs mostly in the innovation dimension, while creating a new product/market.

These examples may be subject to innovation effects, although they have important differences. The first difference is the type of the innovation activity engaged by firms. We are considering as incremental (product) innovation all innovation activities that does not create a new product/market (disruptive). The second difference is related to the adequacy of the conventional approach to merger procedure.

The second example certainly needs a different approach, starting from the first step: relevant market definition. The product dimension of a relevant market definition is a process to identify all goods or services considered close substitutes. However, in our second hypothetical situation, there is no product market yet, so a SSNIP would be unfeasible. Besides, an important characteristic of innovation is the uncertainty regarding future outcomes of innovation efforts: it is impossible to determine whether pipeline projects will be launched (except in close-to-market pipeline projects) and, therefore, whether firms will actually compete in the product market.²² A preliminary conclusion is that traditional relevant market definition may be unfeasible in some innovation competition cases. However, the conventional merger procedure can be applied to the first case when it comes to relevant market definition, just it is for traditional competition of differentiated products. In these cases, competition occurs within a product market, so the HMT can be undertaken as there is price competition, and the product and geographical dimensions can be defined.

Moving to the discussion of the assessment of competitive significance, there will be differences in both cases. When innovation competition is at stake, firm's shares will not provide an indicative of the competitors' significance, incentive and ability to innovate. In our first hypothetical example, there is traditional competition, but as argued in the last subsection, deviation rates and markups are better indicators of competitive significance when firms compete through differentiated products. Furthermore, price should not be the only variable to measure merger effects, as reductions in incremental innovation efforts harms competition. In the second example presented, the fact that the product market is still non-existent reinforces the inadequacy of current sales as indicators of competitive significance and price effects are not considered as well. Actually, the use of shares as proxies of the firms' ability to exercise market power reflects a view of a static competitive environment, represented as the ability of fixing a price above marginal cost. The nature of competition in these markets is dynamic, as the future introduction of new products and processes makes a firm successful, not only its current sales and prices (Katz & Shelanski, 2007; Sidak & Teece, 2009; Shapiro, 2012; Kerber, 2017).

Some literature contribution is devoted to discussing the use of an alternative market definition when the conventional market definition and assessment of competitive significance is inadequate. Gilbert & Sunshine (1995), Katz and Shelanski (2007), Sidak & Teece (2009) and Kerber (2017) suggest the use of a capabilities approach, i.e., both a capabilities-based market definition and competitive assessment. Regarding the market definition, these authors argue that markets should be defined by the skills in innovating and not by their products and, in the case of Sidak & Teece, they propose: (i) the use of the capabilities to innovate (and managerial) in market definition; and (ii) an increase in the importance relegated to potential competition. Analyzing capabilities of current and potential competitors can be done using literature in the field of strategic management and through the analysis of the firm's R&D activities (Sidak & Teece, 2009, p. 36).

²² As it is argued by Jorde & Teece (1990), Gilbert & Sunshine (1995), Katz & Shelanski (2007), Sidak & Teece (2009). Sometimes it is also complex to determine the geographical dimension: there are virtually no transportation costs related to the licensing of the use of intellectual property, which does not influence the geographical dimension of the market.

An early contribution to the assessment of innovation competition mergers which employ the use of capabilities is the Innovation Market Analysis (Gilbert & Sunshine, 1995). The IMA considers that relevant markets, called as innovation markets in this case, should be defined by looking at the overlapping R&D activities, i.e., directed to a particular new products or processes, not only by the merging parties but also from alternative sources of R&D. After identifying competitors, the authorities need to check if the firms have the necessary capabilities and incentives to slowdown or interrupt R&D efforts to consider the merger effects on innovation. The influence of the IMA can be identified in the 1995 version of the Antitrust Guidelines for the Licensing of Intellectual Property, in which innovation markets are defined in a similar way to what Gilbert & Sunshine proposed (Kerber & Kern, 2014, p. 36).

Despite the criticism²³, Gilbert & Sunshine were careful to recommend the use of the IMA in cases in which the R&D efforts are developed enough to make the effects of the introduction of the new product or process in the product market predictable. So, the framework proposed by the authors is destined to assess the effect of mergers on overlapping innovation efforts. It provides important insights regarding the identification of competitors to such innovation efforts but focuses only on firms which are undertaking such efforts. However, the assessment of competitive significance proposed by the IMA includes an assessment of the concentration in R&D, as it would be a proxy of the ability of the merged entity to compete in that innovation market. As section 5 discusses, R&D expenditures may not be the best proxy for the ability of the firm to develop innovation.

3. Innovation Incentives and Harm to Innovation

Adopting a proper framework regarding market definition and assessing competitive significance are important first steps in assessing mergers effects, as authorities need to ensure that their assessment is capturing all possible sources of competitive pressure faced by the merging parties. Yet the agency needs to assess the likelihood of potential harm to competition. We will focus in one effect in particular: the potential merger effect on innovation, by examining how it may alter the incentives to innovate of the merging firms.

3.1 Concentration and Innovation

The discussion on the effects of mergers on innovation incentives is present in the debate on the effects of firm size and concentration on innovation. This topic has a number of contributions arguing in favor of different positions and no final conclusion. In 1942, Schumpeter writes ‘Capitalism, Socialism and Democracy’ and presents his views on the process of innovation, emphasizing the role of the large company and more concentrated markets in promoting innovation, the so-called Schumpeterian Hypotheses.²⁴

The Schumpeterian view is frequently seen as opposite to the model proposed by Arrow (1962). Arrow, assuming an appropriability regime of perfect patent protection, compares the extreme situations of perfect competition and monopoly and concludes that incentives to innovate are higher in the competitive situation due to the so-called replacement effect (investment in R&D by the monopolist would result in cannibalization of at least a part of the firm’s profit) (Gilbert, 2006, p. 165-166). Finally, the controversy between Arrow and Schumpeter is centered in one question: which market structure promote greater incentives to innovate?

There are numerous theoretical and empirical contributions to this debate, such as the patent race

²³ Katz & Shelanski (2007) and Kerber & Kern (2014) list some of the critics over the IMA: arguments that the analysis of potential competition is enough to assess innovation effects (Hay, 1995; Rapp, 1995) or the use of the future goods market analysis (Bernard, 2011), the presumption of negative merger effects on innovation even though there is no clear linkage of the effects of market structure on innovation (Hay, 1995, Rapp, 1995, Davis, 2003), a possible decline in predictability of enforcement (Carlton, 1995) and the lack of legal basis to base decisions in the effects on variables other than prices (Hoerner, 1995; Davis, 2003).

²⁴ In 1912, Schumpeter publishes ‘The Theory of Economic Development’ emphasizing the role of the entrepreneur in introducing innovations, which is known as Schumpeter Mark I. In 1942, he considers big business as the engine of innovation, in ‘Capitalism, Socialism and Democracy’, considered as Schumpeter Mark II (Malerba, 2007, p. 345).

literature,²⁵ and the hypothesis presented by Scherer (1965) in which concentration and innovation would have an inverted U relation: higher levels of concentration generate increases on innovation up to a certain level and further rises in concentration would mean reductions on innovation.^{26,27}

Even though the debate presents important advances, the models have limited applicability: (i) they usually depend on several hypotheses (Kerber, 2017, p. 7);²⁸ (ii) they are hard to be estimated (Gilbert, 2006);²⁹ (iii) there is great variability between different sectors and markets in a number of variables (Cohen, 2010, p. 194).³⁰ Furthermore, a central mechanism to Schumpeter's writings is the endogeneity of firm size, as innovation affects firm's growth. Studies measuring the effect of firm size or concentration on innovation may overlook this effect and present endogeneity (Cohen, 2010, p. 140). Federico, Scott Morton, & Shapiro (2020, p.136) also add that contributions on the literature on competition and innovation may lead to a misleading understanding that excessive competition negatively affects innovation and argue that such a conclusion confuses two different and important question, the effect of changes in cost and demand on innovation and the impact of a specific merger between rivals on innovation.

Concluding, if there are no overall relations between innovation and structure that we can assure a priori, it is not possible to make assumptions of the effects of a specific merger on innovation without understanding the competition and innovation process, meaning that the increase on concentration as a result of the merger cannot be assessed under any presumption of its effect on innovation.

3.2 Business-stealing effects

Considering, as argued, that there is no optimal market structure which maximizes innovation incentives and that merger analysis regarding innovation competition must be undertaken on a case-by-case basis, how to identify whether post-merger innovation incentives will be diminished or not?

There are different contributions that attempt to capture the mergers effects on innovation incentives in a process analogous to the estimation of unilateral price effects.³¹ To consider both possible ways of internalization of externalities placed by price and innovation strategies, Federico, Scott Morton & Shapiro (2020, p. 128) present the broader notion of business-stealing, a dynamic process of gaining or protect sales from rivals by providing value to customers, thorough which firms provide value to the costumers, including price and innovation. So, according to the authors, the business-stealing effect is the internalization of price-related and innovation-related business-stealing effects resulting of the merger and may generate unilateral price effects and unilateral innovation effects, respectively.

The post-merger internalization of innovation-related business-stealing effects reduces the competitive pressure and, therefore, reduces innovation incentives. As a result, the merged firm may reduce innovation efforts, resulting in less innovation. In other words, absent countervailing efficiencies, mergers in which an innovation-related business-stealing effects are internalized result in harm to innovation (Federico, Scott Morton, & Shapiro, 2020, p. 130-135). As in the price-related business-stealing effects case, mergers involving innovation efforts considered close substitutes to the other merging party's product or innovation efforts by the consumer raise higher concerns to the authorities,

²⁵ Which assumes perfect patent protection and winner-take-all markets, as the first to launch the innovative product in the market gets all the profit. For an overview on this literature check Kerber & Kern (2014) and Kerber (2017).

²⁶ Some empirical work has been done regarding the inverted U relation, the most prominent being Aghion et al. (2005). The authors compare innovation incentives in neck-and-neck and leader-laggard industries, concluding that it depends on the specific sector Schumpeterian rents are higher or lower than the escape competition effects. Other references are Gilbert (2006), Sutton (1998, 2007), Cohen (2010).

²⁷ Check Kerber & Kern (2014) for an overview on the literature regarding the inverted U hypothesis.

²⁸ Such as if product is homogenous or differentiated, whether the model includes product or process innovations, appropriability conditions, entry barriers or if competition occurs in price or quantities (Kerber, 2017, p. 7).

²⁹ See Gilbert, 2006, p. 191 -200.

³⁰ Such as demand, opportunity and appropriability conditions. See Cohen (2010, p. 194).

³¹ Farrell & Shapiro (2010, p. 33-34) propose the innovation diversion ratio, which is the share of gross profits earned by a firm when it engages in innovation efforts at the expense of the other merging party's profit. This line of thought is also present in Shapiro (2012) as one of the guiding principles about the relation of competition and innovation is the Contestability Principle, which is "[t]he prospect of gaining or protecting profitable sales by providing greater value to customers spurs innovation" (Shapiro, 2012, p. 364). The reduction of innovation incentives corresponds to the internalization of the negative externalities placed by the firms on each other (Shapiro, 2012, p. 391-392).

as the business-stealing effects tend to be higher.

Innovation competition is naturally a complex subject for competition policy, as the uncertain nature of innovation makes it harder to assess post-merger effects on the introduction of innovation. The mechanism of assessing whether a merger internalize business-stealing effects is a way to identify such possible sources of harm. The next section uses such a criterion to identify the different situations in which there may be harm to innovation: the different faces of innovation competition.

Before moving on, two important observations must be made. First, the business-stealing effect contributes only to the examination of the anticompetitive side of mergers. This is natural given that this process identifies theories of harm to innovation and does not present a final conclusion on the net effects of mergers on innovation. However, there are situations in which mergers internalize positive innovation externalities and may increase both incentives and the ability to introduce innovations, such as when there are synergies and increases in appropriability arising from the merger (Shapiro, 2012).³²

4. The different faces of innovation competition and the theories of harm to innovation

There are different situations in which innovation competition is at stake and, therefore, need different merger enforcement. Baker (2007) list types of markets which demand enforcement to protect innovation.³³ Katz & Shelanski (2007) make an effort in proposing canonical situations representing the idea that depending on how close innovation is to market launch, there will be differences in the enforcement itself. Federico, Scott Morton & Shapiro (2020) use the mechanism described in the last section. i.e., there are innovation-related business-stealing effects. These contributions form the basis of our discussion and will be revisited throughout this section.

The situations where innovation competition occurs exemplified before for market definition's debate purposes are also useful to show different situations in which innovation-related business-stealing effects may be identified. The first one is when firms compete in the product market while engaging on innovation efforts to improve its product to capture sales from its competitors (incremental innovation). To the second situation - when two or more companies are in a race to enter a new market and are simultaneously undertaking competing innovation efforts- we can also add the case in which one of the merging parties is engaging on innovation efforts to create a new product and enter an existing product market explored already by the other firm, considering in both cases also the situations in which the innovation efforts are close to market launch. An additional third situation is when two or more companies have similar capabilities and lines of research and, therefore, are likely to be rivals in future innovation efforts, even when they are not competing in a product market or in a race to develop competing products. In this last case, the existence of different firms with the necessary capabilities and similar lines of research (a previous step of innovation efforts) provides competitive pressure on each other. The three examples represent what we will call by the different faces of innovation competition: through incremental innovation, through ongoing innovation efforts for new products and through future innovation efforts.³⁴ In the same merger, all three faces of innovation competition may be at stake,

³² Synergies, such as making R&D efforts more efficient by getting together complementary capabilities (Bena & Li, 2014, p.195) or the transfer of technology between firms (Federico, Scott Morton, & Shapiro, 2020, p.134) need to be merger specific. Increases in appropriability do not have a clear-cut effect on innovation incentives, they may increase innovation incentives for the merging parties, see Federico, Scott Morton, Shapiro (2020, p. 133), while reducing innovation incentives to rivals (Baker, 2008; Gilbert & Rubinfeld, 2010; Shapiro, 2012).

³³ Which are (i) winner-take-all or winner-take-most markets, (ii) industries where technological or regulatory developments determine future competition, (iii) rapidly growing industries. For more details, see Baker (2007).

³⁴ The typology for the three faces of innovation competition follows Federico, Scott Morton, & Shapiro (2020) and Katz & Shelanski (2007) to some extent, but with important differences. The first canonical case in Katz & Shelanski (2007) is the one in which innovation is well underway to create or improve defined products and processes. By understanding that improved products, i.e., achieved through incremental innovation, need a specific assessment, we added the innovation competition through incremental innovation category by understanding that it is characterized by competition within the product market and, therefore, demanded a conventional assessment with minor changes, unlike the two other categories. The innovation competition through ongoing innovation efforts to develop new products is similar to the first canonical case in Katz & Shelanski (2007), when a new product is created, and the pipeline overlaps category in Federico, Scott Morton, & Shapiro (2020) but we include here the situations in which innovation does not occur through a well-defined pipeline procedure. The specific case in which two firms are racing

demanding assessment from potential innovation effects by Competition Policy, but with different approaches, as we will argue.

The following subsections address each of the three faces of innovation competition, presenting the each one's main features and adequate assessment, including the theories of harm of these situations as well as possible evidence and practical issues and challenges that must be overcome. We will also include cases from the international jurisprudence to illustrate when it is possible.

4.1 Innovation competition through incremental innovation efforts in the product market

Incremental innovation efforts may be directed to create newer and better versions of existing products. Whenever there are innovation efforts in a product market for incremental innovation, we can say that this market presents traditional competition and innovation competition simultaneously.

As there is competition in the product market, the relevant market definition may be undertaken through the traditional analysis as we argued in section 2. Following Katz & Shelanski (2007), the notion here is at their first canonical case when innovation is well underway to create or improve defined products and processes (as this subsection discusses incremental innovation, the object here is just the improvement of products). They argue that competition is focused on the product market and the results of innovation are tangible, what makes a traditional assessment more adequate. In the competitive assessment, as innovation efforts are being undertaken toward improving incumbent products, the effects of the merger on innovation in this market needs to be considered, as it may result in lower innovation incentives. Section 2 presented arguments towards the discussion of effects in differentiated products markets can be applied here: if two product market competitors merge and the competitive pressure is reduced, they may be less intended to improve their products, in our case, by engaging on innovation efforts. Individual or resulting shares and concentration variation may be not as relevant just as in differentiated products markets.

Thus, the traditional price effect assessment would be insufficient here. The possible theories of harm to innovation are the reduction and the interruption in the introduction of incremental innovation. Considering the business-stealing effect mechanism, the substitutability between the parties' product is an important evidence, as close substitutes tend to impose higher business-stealing effects on each other (Federico, Scott Morton, & Shapiro, 2020, p. 129). Another important evidence is whether one of the merging parties is a frequent innovator, as harm to innovation tends to be higher if the frequent innovator places larger business-stealing effects on the other merging party. In this case, the more frequently the firm introduces innovation in the market, the greater the competitive pressure exerted by the firm is, as more sales are expected to be diverted (otherwise the other players will need to reduce price or improve their products). We can call a frequent and disruptive innovator as an innovation maverick.³⁵ Finally, in the absence of external rivalry, i.e., if the merger gets together two out of a few competing firms engaging in incremental innovation efforts, harm to innovation tends to be higher.³⁶

Some practical issues must be added here. First, the merging parties' history of bringing innovations to the market (such as new versions or new features to existing products) is an important evidence for this analysis. Second, incremental innovation is more often the result of internal learning and accumulation of capabilities and knowledge than through R&D efforts (Malerba, 1992, p. 857). So, in these cases, the authorities' concerns are frequently not related to specific pipeline projects and the effect of post-merger reduced incentives on them, but rather on the removal of a player which has a strategy and ability of bringing incremental innovations to the market. As we are assuming as

to the market with competing innovation efforts matches the winner-take-all/winner-take-most case in Baker (2007). Finally, the innovation competition through future innovation efforts is very similar to the overlaps in capabilities category in Federico, Scott Morton, & Shapiro (2020).

³⁵ As the usual effect of the elimination of mavericks is that it may facilitate collusion (European Commission, 2004; Department of Justice; Federal Trade Commission, 2010; Bundeskartellamt, 2012; CADE, 2016). In this hypothetical case, we call it innovation maverick as the firm exerts its aggressive behavior through introducing frequent innovations and in a pioneering way than its rivals.

³⁶ The reasoning for such an effect lies in the notion that a firm which engages in incremental innovation efforts is likely to capture more sales as a result of its innovation effort when there is a reduced number of other firms undertaking such effort.

incremental innovation all cases in which there is no creation of a new market or product, the firms may need to incur in some cost or risk to innovate in this direction (i.e., it is not a result of their established routines), otherwise there will be no reason to believe that the merged firm would be able or would have incentives to diminish innovation.

One example is the AT&T/T-Mobile case³⁷ in the United States. The attempted acquisition of T-Mobile by AT&T (both mobile wireless telecommunication services provider) caught the attention due to T-Mobile's market behavior. The company was known for its aggressive strategies both on prices and on innovation in a market particularly favorable for coordination.³⁸ The company introduced frequent innovation as part of its strategy to challenge US top 3 firms (by the time of the procedure, T-Mobile was the fourth largest mobile wireless telecommunication services provider) (Department of Justice, 2011). The pricing and innovation strategy of T-Mobile may characterize it as an important frequent innovator.³⁹ In AT&T/T-Mobile, the DoJ considered that the merger would not only result in higher prices and less investment, but also less innovation and variety.⁴⁰

4.2 Innovation competition through ongoing innovation efforts for developing new products

When in a merger there is an overlap between the ongoing innovation efforts for developing a new product of one of the parties with the other parties' innovation efforts or incumbent products, authorities need to assess how the merger may affect innovation incentives related to those innovation efforts.

Before discussing these situations, an important disclaimer must be made. To match the definition used by Federico, Scott Morton & Shapiro (2020) and for simplification, we will call the ongoing innovation efforts for developing a new product as pipeline projects. Some industries may develop new products without a strict step-by-step pipeline process, and the idea here is to capture a broad set of innovation efforts destined to new products.

Going back to the first canonical case of Katz & Shelanski (2007), when innovation is well underway to create or improve defined products and processes, the authors argue that in mergers involving pipeline projects near market launch, the agencies' enforcement must be focused on traditional product market assessment, as the introduction of the new product is just a matter of time and the firm is already a potential competitor (Katz & Shelanski, 2007, p. 65-66).⁴¹ Earlier pipeline projects must be enforced and assessed in a different way, as there are significant innovation efforts still needed to successfully enter product market and authorities must ensure that the merged firm will have proper incentives to keep carrying them on. The key factor to decide whether the case can be scrutinized through the traditional assessment used in traditional competition or not is precisely whether proper innovation incentives are needed to finish the development of the product. If they are, the assessment must be undertaken differently, through the capabilities-based assessment.

As discussed in subsection 2.2, cases in which competition occurs mostly in the innovation dimension, a capabilities-based market definition and assessment of competitive significance is necessary to accurately analyze merger effects. In practical terms, the competitive pressure exerted by alternatives sources of R&D - i.e., other pipeline projects considered as possible substitutes in a future product market or firms with lines of research and capabilities to successfully engage in competing innovation efforts needs to be considered. The definition of the relevant market here - an innovation market - must consider all these participants and the significance of such alternative sources of R&D should be taken by the ability of firms in successfully bringing such pipeline projects to the market. Also, the risks and costs of developing the necessary capabilities to innovate in a given area are barriers to entry in the innovation

³⁷ Case 1:11-cv-01560.

³⁸ According to the DoJ complaint, aspects such as transparent pricing, little buyer-side market power and high barriers to entry and expansion make the mobile wireless telecommunication services markets more conducive to coordination (Department of Justice, 2011).

³⁹ The DoJ presented two internal documents of T-Mobile that supported the claim. The first one emphasizes the role of the company in bringing innovation to the market, listing several successful introductions of innovations. The second one showed plan for keeping the pace in bringing innovations in the market in the future (Department of Justice, 2011).

⁴⁰ The DoJ announced that it would seek to block the acquisition in August 2011, and the bid ended up being abandoned by AT&T in December of the same year.

⁴¹ The determining factors are not only the imminence of market launch, but also if most of the cost to develop the product have already been undertaken (Federico, Scott Morton, & Shapiro, 2020, p. 139).

market in the short term and in part are barriers to entry on the product market through innovation efforts in middle or long term.

In those cases, some factors are decisive to assess the effects of the merger on ongoing innovation efforts, i.e., in the incentives to bring the pipeline project to the market and are important evidence for assessing potential harm. The first two are the substitutability between the parties' products in the future product market and the time to market launch, both are positively correlated with the business-stealing effects. Besides, another decisive factor for the need for enforcement is the absence of external rivalry, i.e., other players capable of representing a threat to the merging parties, by having competing innovation efforts or the necessary capabilities to successfully engage in competing innovation efforts (Solidoro, 2019, p. 2; Federico, Scott Morton, & Shapiro, 2020, p. 139-140).

One possible scenario is a case of product-to-pipeline overlap, in which one of the merging parties has a product already in the product market and the other one is undertaking innovation efforts to enter in this market (Federico, Scott Morton, & Shapiro, 2020, p. 140-142). Suppose that a firm is undertaking innovation efforts to develop a new product, for instance a pharmaceutical drug, to compete against a drug already being sold by another firm. The perspective of market launch of the new drug places business-stealing effects for the incumbent, as it could expect to lose sales in the future. If a merger occurs between the two firms, the merged entity could have incentives to slow or even shut down the pipeline project, as it would cannibalize sales from the launched drug. The more sales that would be diverted from the incumbent drug to the entrant one, the more contestable are the incumbent's sales and the less incentive the merging entity has to continue developing the pipeline project. At the same time, the existence of rivalry pressure of other players within the innovation market and their time and costs necessary to the product launch matter. An example is the Pfizer/Hospira case.⁴²

An alternative scenario is the pipeline-to-pipeline overlap, a case in which both of the merging parties have ongoing innovation efforts to develop products which will be competitors in the product market in the future in case they are successfully introduced (Federico, Scott Morton & Shapiro, 2020, p. 142). As in product-to-pipeline cases, assessment will depend on how developed the pipeline projects are. If significant investments are needed, the authorities need to check whether the merger may create incentives to slowdown or interrupt the firms' innovation efforts. A special situation in this case – following the second canonical case presented by Katz & Shelanski (2007) – is the innovation-based race to market dominance.⁴³ In this specific situation, there are no incumbent products sold by a third party in the market which could compete with the overlapping pipeline projects.⁴⁴

⁴² The Pfizer/Hospira case (the acquisition of Hospira would make it a subsidiary of Pfizer) involves the overlap of a few drugs, but three of them were product-to-pipeline overlaps, each one subject to different enforcement. First, there was a pipeline drug being developed by Pfizer (on Phase III clinical trials), which would be a competitor to Hospira's product, already in the market. The European Commission expressed concerns about the effects of the merger in the incentives to develop the drug, as there was only one Phase III pipeline competitor, and it was facing challenges to develop the drug (European Commission, 2015, p. 9-15). Second, Hospira had a pipeline generic drug, linezolid, which would be a future competitor to Pfizer's Zyvox, the original drug. In that case, the Commission considered that there were a great number of players developing generic drugs, as Pfizer's patent was about to end. Last, as in the linezolid case, Pfizer was the producer of an original drug, voriconazole, with its patent about to end in the moment of the transaction, and Hospira had a pipeline generic drug. Hospira's drug already had finished development and had already obtained marketing authorization. This market has the specificity capability concern as the drug needs a specialized solubilizer which Pfizer produces and Hospira had already entered in an agreement with Pfizer to ensure the supply, but other competitors did not make similar moves to guarantee the input needed to fully commercialize competitors (p. 47-49). In all the cases presented above, the products were close substitutes, as we are dealing with generic and biosimilar drugs, considered to be equivalent in efficacy to the original drugs. The closeness of market launch differed in the cases, as Pfizer's infliximab pipeline drug was in Phase III clinical trials and Hospira's generic voriconazole was already ready for launch.⁴² Even though there were differences in the time perspectives for market launch, both cases had divestment remedies. What made both require divestments was the lack of strong rivals capable of exerting competitive pressure: there was only one Phase III competitor pipeline drug in the infliximab case, and it was facing challenges to develop its product, while there was not any competitor moving to ensure the supply of the necessary inputs to develop the voriconazole generic. On the other hand, the linezolid market had plenty of external rivalry, reason that made the Commission require no remedies in that case (European Commission, 2015).

⁴³ Also known as winner-take-all (or winner-take-most in some cases) markets, as due to the IP rights regime, economies of scale, network effects and lack of strong buyer preferences the first firm to enter to achieve market launch captures all (or most) sales (Baker, 2007, p. 593-594; Katz & Shelanski, 2007, p. 66).

⁴⁴ An example of a pipeline-to-pipeline overlap is the 2001 acquisition of Novazyme, a pharmaceutical startup, by Genzyme, a large company in the industry (FTC File No. 021-0026). Novazyme was developing a drug for treating Pompe Disease, while Genzyme had three pipeline projects destined to same disease. The two firms were the only

There are important difficulties for implementation in these cases concerning pipeline projects. The common factor on both product-to-pipeline and pipeline-to-pipeline overlaps cases presented is the fact that they are on the pharmaceutical sector, which has a very particular specificity: The R&D process is a step-by-step well-defined procedure due to regulatory requirements. Other sectors such as medical devices and chemicals may also present a structured R&D procedure, when it is easier to check the three decisive factors for enforcement: the degree of substitutability between the parties' product in the future product market is mostly known because the future use of this product is known throughout the pipeline phases, there can be estimates of time to market based on the phase of the R&D process and finally, it is easier to know not only which competitors there are, but also the phase in which their pipeline projects are. So, building a theory of harm to innovation based on pipelines projects is easier on certain industries.⁴⁵ However, as discussed in the beginning of the subsection, the effects of mergers on ongoing non-pipeline innovation efforts also need to be assessed. In cases in which R&D is not structured and/or there is not easily available information about the pipeline projects of the parties, the authorities should demand that firms present a list of the ongoing innovation efforts. In case there are overlaps, the authority will face a hard task in finding evidentiary proxies, but an alternative for merger assessment is requesting an expert's testimony on the stage of development of the projects. Section 5 briefly discusses alternatives for such evidence.

Besides, it is possible that the overlap identified are not only when the innovation efforts are in pipeline stages (or equivalent stages for other sectors), but in earlier phases. This type of analysis was applied in the EC assessment of Dow Dupont (2017), in which it is presented the notion of competition over innovation spaces, which are discovery targets pursued by the firms. To adequately assess this competition the authorities must also look at early-stage innovation efforts, e.g., the discovery of new active ingredients (AIs) which may be used as inputs to downstream product markets and at the firms' lines of research (European Commission, 2017, p. 314; Petit, 2018, p. 5-6; Jung & Sinclair, 2019, p. 271). We can understand the notion of competition over innovation spaces as broadening the scope of the assessment of cases in which there are overlaps involving ongoing innovation efforts, including competition in the steps which precede pipeline stages. In this way, the assessment of the effect of a merger on ongoing innovation efforts for new products, must not only consider the effects in incentives related to close-to-market pipeline projects and to earlier stages of the pipeline, but also in stages that precede the pipeline.

Concluding, in pipeline-to-pipeline or product-to-pipeline cases, if the merging parties' pipeline projects are close to being launched in the product market, and all the significant costs related to the innovation efforts have already been undertaken, the case can be assessed through the conventional approach as there is no significant risk of discontinuation of the pipeline project and short-run price effects (or other effects, including incremental innovation if it is the case in the product market competition) turns into the analysis' main question. However, if there is a risk of interrupting the development of the product, i.e., the pipeline project is not close to market launch, competition is occurring in the innovation dimension and needs to be assessed with a capabilities-based assessment to protect incentives to innovate, i.e., market definition needs to include all firms with competing pipelines and capabilities directed to the development of that particular product. Harm to innovation may occur through the reduction of innovation incentives to innovation, which may result in the delay or interruption of ongoing innovation efforts. Harm to specific ongoing innovation efforts needs also to be assessed in the steps which precede pipeline stages, when it is relevant to the case. Finally, as stated before, there are relevant practical issues as there is no structured R&D procedure.

4.3 Innovation competition through future innovation efforts

When firms have overlapping capabilities, even when they are not currently undertaking innovation efforts, there are business-stealing effects placed by the firms on each other, as firms face the perspective of losing sales to rivals when they introduce new products in the future (Federico, Scott Morton, & Shapiro, 2020, p. 146-147).

A merger between two or more of those firms, by internalizing these business-stealing effects,

two developing treatments for Pompe in the world. Even though the FTC decided to close investigations and not to challenge the merger the debate was centered on a possible anticompetitive effect involving the slowdown or complete shutdown of the innovation project, just as the theories of harm concerning pipeline overlaps usually do.

⁴⁵ Digital innovations are frequently not developed through a well-structured R&D process as Crémer, Montjoye, & Schweitzer (2019, p. 120) argue.

may lead to a lessening of overall innovation incentives of the merged firm and its rivals, without a link to a specific product market or ongoing innovation effort. By reducing generic innovation incentives, but underlined by the capabilities of a specific area, the merger diminishes incentives related to innovation efforts which are not being undertaken at the moment and could be started in the future if there are enough incentives to do so, i.e., future innovation efforts. Reduced incentives for both of the merging parties and their competitors in engaging in new innovation efforts is more likely to occur when firms have overlapping lines of research as there is a greater probability that firms engage in competing innovation efforts. This is a first important evidence to build the theory of harm of the case.

The traditional step-by-step assessment is not appropriate to assess the effects of mergers on incentives related to future innovation efforts, as there is not a product market that may be defined. Also, the competitive pressure in these cases arise from the existence of other firms with similar capabilities and lines of research, so a capabilities-based merger assessment is recommended to properly capture the competitive pressure related to incentives to undertake future innovation efforts.

Merger assessment related to future innovation efforts may sound speculative at first, as there is a lot of uncertainty regarding innovation efforts that could be undertaken in the future, but there are reasons to assume that in specific cases a merger may significantly reduce the likeliness that innovations would be introduced in the future. To begin with, a first necessary condition is whether the merger brings together firms with overlapping capabilities and lines of research. There may be a reduction in incentives to engage in future innovation efforts if the merging firms: (i) are two of a limited number of firms with the necessary capabilities to innovate in certain areas; (ii) have a history in bringing new products in that area (specially in sectors in which innovation requires expertise and experience makes innovation more likely); (iii) have past and current product and pipeline overlaps as well as patent portfolios, which may indicate that firms have overlaps in capabilities; (iv) and other possible players are limited by the existence of durable barriers to entry or if there is low rivalry in the innovation market in question (Federico, Scott Morton & Shapiro, 2020, p. 147-148). However, some of these evidence for overlapping capabilities are available mostly in sectors which have structured R&D procedures, as in the ongoing innovation efforts analysis, namely current pipeline overlaps and, often, patent portfolios.

Dow/Dupont (2017) is an important case to the discussion of innovation competition through future innovation efforts. It adds to the debate not only by introducing the concept of innovation spaces, discovery targets pursued by the firms, to the assessment, but also by bringing an intense discussion regarding the effects of mergers in the innovation incentives related to future innovation efforts.

As discussed throughout this section, incremental innovation and close-to-market overlapping product-to-pipeline or pipeline-to-pipeline cases can be assessed through the traditional step-by-step assessment. In the first situation competition occurs naturally in the product market and in the second the innovation efforts are no longer under the risk of being interrupted and already exert pricing pressure on incumbent rivals, as market launch is a matter of time. On the other hand, overlapping pipeline-to-pipeline and product-to-pipeline cases in which products being developed still need innovation efforts, as well as the assessment of the effects of merger in incentives related to future innovation efforts, need to be scrutinized under a capabilities-based assessment, including delimiting innovation markets in the case as well, as the business-stealing effects in these assessments comes also from other sources than product market competitors: firms with enough capabilities to place such rivalry through innovation.

5. Capabilities Approach and implications for merger assessment

Authors such as Gilbert & Sunshine (1995), Katz & Shelanski (2007), Sidak & Teece (2009) and Kerber (2017) argue in favor of using capabilities in the whole competitive assessment, changing traditional steps in merger analysis. As the traditional relevant market definition is inadequate to assess innovation competition markets⁴⁶ and the IMA has the limitations presented in subsection 2.2 (such as the use of concentration in R&D expenditure as proxy of the firms' ability to compete on innovation), a viable option to carry on the assessment of the innovation dimension of competition is to directly identify viable players and their competitive significance as suggested by Kerber (2017, p. 13) and closely related to the basic idea of the IMA. To do so, it is necessary to understand: (i) which are the lines of research in which the merging parties are capable of developing innovation; (ii) which other firms are also capable of developing innovations in the same lines of research; and (iii) how capable are these firms in developing innovations in the defined lines of research. It is also important to develop a framework which addresses the challenges identified throughout the text, namely assessing the competitive significance and evidence to build the theory of harm in sectors which innovation is not generated by a well-structured R&D procedure.

This section discusses market definition and the assessment of competitive significance under a capabilities-based framework, from the perspective of its theoretical background and also debates the challenges of practical application by discussing the Dow/Dupont case.

5.1 Alternative theory of the firm and the capabilities-based assessment

The resource-based approach, based on the early work of Edith Penrose (1959), considers that firms are heterogeneous in many dimensions and can be defined as bundles of resources and those represent their ability. Furthermore, the ability of the firm is defined by the resources it has: a firm which has more resources to enter a specific markets than others is more competitive. Some call these resources as capabilities (Sidak & Teece, 2009, p. 38; Kerber, 2017, p. 10).

Other authors take Penrose's approach further and in different directions. Richard Nelson (1991) explores the concept of core capabilities, i.e. what a firm can do well and concludes that in technology-based industries, a firm needs a set of R&D core capabilities which define the R&D projects that a firm can undertake with confidence and success and the ones that it cannot. David Teece (2007) discusses the ability of a firm to adapt to a changing environment and technological opportunities, its dynamic capabilities. All these contributions explore the resources and features that makes a firm capable of undertaking innovation efforts and succeeding in bringing innovation to the market (Paranhos & Hasenclever, 2017, p. 103-105).⁴⁷

Penrose's contributions represent important theoretical foundations for research in the strategic management literature and evolutionary theory. All of the contributions presented above provide insights to the process of identifying competitors and assessing their ability to innovate, but Nelson's findings invites a closer look. Core capabilities in R&D represents what kinds of innovation efforts the firm can viably engage. A firm which its core capabilities are related to markets A and B is unlikely to undertake R&D efforts to enter market C, even though it may have the technical capabilities to do so. Some specificities are responsible for defining those capabilities, as "[t]hese capabilities will be defined and constrained by the skills experience, and knowledge of the personnel in the R&D department, the nature of the extant teams and procedures for forming new ones, the character of the decision making process, the links between R&D and production and marketing, etc." (Nelson, 1991, p. 68)

Besides core capabilities, a somewhat similar notion, the concept of core competences is present in the resource-based strategic management literature.⁴⁸ Prahalad & Hamel (1990, p. 4-6) consider it as a combination of skills and resources that make the firm idiosyncratic. Schilling (2013) define it as: "A core competency arises from a firm's ability to combine and harmonize multiple primary abilities in which the firm excels into a few key building blocks of specialized expertise." (Schilling, 2013, p. 118). From these expertises, firms can produce different business and products.⁴⁹

⁴⁶ The Hypothetical Monopolist Test could not be used correctly, because in addition to not knowing the future substitutes of the product markets, a technological change that reduces costs can make mere price maintenance an indicator of market power, weakening the relevance of the analysis of an SSNIP.

⁴⁷ For a review on the discussions on the theory of the firm and the innovative firm, see Paranhos & Hasenclever (2017).

⁴⁸ See Schilling (2013) for conceptual discussion.

⁴⁹ Prahalad & Hamel (1990) use the example of Casio, which has the core competence to produce displays, from which it was able to successfully introduce different businesses such as calculators, laptop monitors and car dashboards (Prahalad & Hamel, 1990, p. 4-5).

So, if identifying the resources/capabilities necessary to innovate in a given market helps the analyst understand which firms are capable of innovating, finding similar core capabilities/competences explains how likely a firm is to engage into innovation efforts and can help the analyst filter firms which are likely to engage on innovation efforts on the same lines of research as the merging parties. Prahalad & Hamel's suggest looking at three factors to identify core competences: it must provide access to a wide variety of markets, be a source of differentiation and hard to imitate (Prahalad & Hamel, 1990, p. 7).

Another important factor to understand the likeliness not only of initiating innovation efforts but also of succeeding in introducing innovation is the cumulative technology case. As Dosi & Nelson (2010, p. 73) argue, there may be dynamic increasing returns to knowledge, i.e. successes may generate other successes. Firms with a history of successfully introducing technologies may be in a better position to create new products and processes in a given market.

From an the point of view of merger assessment, identifying if companies have clear core competences/capabilities and if they fit the cumulative technology case may help the analyst understand if the companies' lines of research are more likely to be successful in developing future products. Therefore, we find that such assessment may: (i) help identify which external rivals may exert competitive pressure in the ongoing innovation efforts for new products and future innovation efforts cases; (ii) constitute specially important evidences of the firm's competitive significance in cases in which innovation does not occur through a structured R&D procedure; (iii) represent evidence of possible harm in the future innovation efforts cases, through the identification of overlapping capabilities. Besides, core competences may be complementary, i.e. one of the merging parties' competences or capabilities may fit the other parties' core competences, constituting a possible countervailing efficiency. An expert's testimony may be helpful for assessing these informations. However, it is important to notice that the enhanced harm to innovation when there is cumulativeness occurs at firm level. Dosi & Nelson (2010, p. 73-74) argue that cumulativeness may also occur at industry level.

Analyzing the conditions of entry in the innovation market is a key issue for evaluating the likeliness that there will be actual competitive pressure on innovation competition cases. Successfully engaging on innovation efforts depends on a number of capabilities in many sectors, so the authorities must carefully investigate which ones are necessary, how quickly and on which terms they may be obtained they can to conclude whether entry is easy or not. Switching costs, transaction and learning costs, as well as network effects have an important impact (OECD, 2002, p. 27-28).⁵⁰ More generally, the necessary capabilities for initiating innovation efforts vary among sectors and markets may potentially make entry harder.⁵¹ Furthermore, in sectors in which firms have a cumulative technology regime, entry in the innovation market is less likely than the alternative case, as a greater expertise is necessary for conducting innovation efforts and the established firms have greater know-how.

Thus, when it comes to practical application, the capabilities approach may struggle, as identifying capabilities is by no means an easy task. However, using specialized literature on strategic management or business is a way to do so (Sidak & Teece, 2009, p. 36).

5.2 Challenges of practical application: Dow/Dupont (2017)

In Dow/Dupont, the European Commission identified competitors in a relatively easy way. Patenting is frequently done in this industry and there is public information on patent requests. Request on ISO names and presentation to investors are also cited as info which helps acknowledging competitors. Those factors make finding overlapping capabilities feasible.

Also, the EC investigated how the process of R&D work in the crop protection business. They concluded that before market launch, the R&D processes have two main phases: discovery and development. The EC found that there are five large-scaled companies which act not only in discovery and development, but in the whole value chain of crop protection business, the other players act only in R&D

⁵⁰ For instance, the availability of a knowledge base may be an important factor to assess the conditions of entry, as in sectors in which the technologies developed are based on public knowledge bases (such as the results of research undertaken by universities or government labs) are easier to engage on innovation efforts when compared to the ones which depend on proprietary knowledge (Jorde & Teece, 1990, p. 38).

⁵¹ Federico, Scott Morton & Shapiro (2020) suggests which assets could be included in an assessment: "...intellectual property; access to technology; human capital, such as skilled scientists or engineers; R&D facilities, such as laboratories and specialized equipment; specialized regulatory, distribution, and commercialization assets; intangible assets such as track record with customers; and access to an installed base of existing customers who can be upgraded to a new technology." (Federico, Scott Morton, & Shapiro, 2020, p. 146). As an example, the necessary capabilities in the digital sector may include data, engineering skills, high computing power and venture capital (Bourreau & de Streel, 2019, p. 26).

and need to partner up to bring the new products to markets or work in small scales. Only five companies have the necessary capabilities to successfully bring a new product to market in a sufficiently large scale (European Commission, 2017, p. 358).

Regarding the assessment of competitive significance, the EC proposed two measures: (i) patent shares and (ii) new active ingredient shares, to identify the strength of companies in both stages of R&D: discovery and development. The first one measures the number of citations of patents in the companies' portfolio. The logic here is that competitive firms in discovery are able to introduce highly cited patents.⁵² The new active ingredients share is the number of AIs produced by R&D players weighted by the turnover generated by each AI. This measurement captures not only the capabilities to developing the AI itself but also to produce in large scale and successfully commercialize it.

So, in Dow/Dupont, the EC was able to find proxies for the ability of firms mainly due to the fact that the sector has public availability of data and the R&D process is structured, i.e., there is a well-defined step-by-step procedure, therefore analysts may identify the strength of the merging parties and its competitors in each step. However, as mentioned throughout the text, in other sectors such as the ones in which R&D occurs in a less structured way or innovation is less R&D-intensive, an analysis in the same grounds may be unfeasible. In these cases, the analysis of the core capabilities/competences and the cumulativeness of the firm's technology regime may represent alternatives to identifying the strength of the merging parties and its competitors. Even in the cases in which the results of the core capabilities/competences and cumulativeness analysis do not give a precise answer on the ability of the firms, it may be used as a screening tool to select which firms are capable of exerting competitive pressure for future innovation efforts.

6. Concluding Remarks

Throughout this paper we aimed to build a scheme for the choice of framework to be applied to the assessment of horizontal mergers in which there is innovation competition. We pursued this goal by looking for a mechanism to identify the different faces of innovation competition, as well as proper market definition and assessment of competitive significance for each face, stating when the conventional approach to merger analysis could be used and when an alternative approach is needed. We also presented the appropriate theories of harm to innovation for each case and discussed under the incentives to innovate literature, including the business-stealing mechanism, the resource-based theory and evolutionary contributions to build a list of some possible relevant evidence for the analysis.

Horizontal harm through post-merger reductions of innovation incentives are concrete threats in some identified cases and need to be investigated. These situations, which may be at stake in the same merger, represent the three different faces of innovation competition: through incremental innovation efforts in the product market, through ongoing efforts to develop new products (pipeline-product and pipeline-pipeline overlaps) and through future innovation efforts, respectively. Thus, we propose the taxonomy of the three faces of innovation competition as an extension of the one proposed by Federico, Scott Morton & Shapiro (2020)⁵³, including the incremental innovation case, as a first step towards providing a framework of assessment for each case, and focusing on the innovation competition dimension. These three faces may be present in a single merger case. It is important to add that even in the case that the authorities consider that there is harm to innovation, possible synergies arising from the merger need to be assessed as they may countervail such harm when looking at the net merger effect on innovation.

As discussed, some of these cases may be assessed through the traditional analysis: when innovation competition occurs in the product market (through incremental innovation) or when new products are close to market launch. In the latter case there is no expected negative effects on innovation. Challenges faced by the agency are similar to the ones in differentiated products mergers. When there are ongoing innovation efforts for new products not close to market launch and when there are overlaps in capabilities, we propose using the capabilities-based assessment. By these capabilities-based assessment we are calling not only the contributions in the direction of defining innovation markets (as in the IMA), but also including some insights taken from the literature to suggest new elements for the assessment of these cases, specially to

⁵² As companies are more likely to cite their own patents, the EC decided to consider only external citations. However, total citations (external and internal) are used as sensitivity tests.

⁵³ We classified those cases, from the examination of sort of cases where the innovation-related business-stealing effects mechanism (Federico, Scott Morton, & Shapiro, 2020, p. 128-130), which are: (i) when the merging parties are competitors in the product market and at least one of them engages in incremental innovation efforts; (ii) when the merging parties present overlaps in ongoing innovation efforts for developing new products with other ongoing innovation efforts of incumbent products; and (iii) when the merging parties present overlaps in capabilities

help the identification of relevant competitors, the competitive significance and pressure they and the merging firms may impose through innovation competition. The careful examination of the assets and attributes that configure the capabilities to innovate that are relevant in each market and observed in a firm-specific level.

Table 1 -The theories of harm to innovation and the faces of innovation competition

Form of Innovation Competition	Source of innovation-related business-stealing effects	Type of Assessment	Theories of Harm to Innovation	Evidence
Incremental Innovation	Overlap in the product market and at least one of the parties undertakes incremental innovation efforts	Traditional	Reduction or interruption in the introduction of incremental innovations in the market	Substitutability between the parties' products History in bringing incremental innovation in markets Frequent Innovator, especially when innovation maverick Absence of external rivalry (investing in incremental innovation)
Ongoing efforts to create new products	Overlap between efforts to develop new products from one of the parties with other innovation efforts or incumbent products	Capabilities-based (if not close to market launch)	Delay or interruption of innovative efforts	Substitutability between the parties' products Absence of external rivalry (engaging in competing innovation efforts and with similar Core Capabilities and Core Competences and cumulative innovative successes) Time to market
		Traditional (if close to market launch)	No theories of Harm to Innovation, unless the market demands further incremental innovation efforts	In the case in which the market demands further incremental innovation efforts, evidence is similar to the incremental innovation case
Future Innovative Efforts	Overlap in capabilities	Capabilities-based	Reduction of incentives to undertake future innovation efforts	Overlapping lines of research History in bringing innovation in the area Absence of external rivalry Past and current product and pipeline overlaps Patent portfolios Durable barriers to entry Cumulative innovative successes Similar Core Capabilities and Core Competences

Source: own elaboration

Table 1 presents an overview of the result of the paper. It also must be read by permitting different conditions to assess innovation competition as the same merger may present different combinations of these overlaps and, therefore, different assessments are needed.⁵⁴ Also, a specific type of case in which different faces of innovation competition are at stake is worth mentioning. Suppose that a merger in which there are ongoing innovation efforts for new products not close to market launch. There are differences in products which do not demand further innovation efforts to compete in the market after being launched (e.g., specific medicines) and products which demand persistent incremental innovation efforts to keep the product competitive (e.g., smartphones). In the latter case, the authorities need to not only ensure that there are proper innovation incentives to guarantee that the pipeline product will be launched, but also that there

⁵⁴ E.g., the merging parties 1 and 2 may (i) be competitors in product market A and 1 has a strategy of bringing continuous improvements to its product A1; (ii) be engaging in early innovation efforts to enter in market B and (iii) have overlapping capabilities that make it possible that the merging parties engage in competing innovation efforts. In market A, the authorities would need to conduct a traditional step-by-step assessment to check possible anticompetitive effects in the product market, including not only price effects but also possible harm to innovation in the form of reduced incentives to undertake incremental innovation efforts. In (ii), considering that both pipeline projects are not close to market launch, assessment must ensure that post-merger innovation incentives would not result in slowing or interrupting the development of the new products by examining the competitive pressure exerted by competitors. Finally, authorities would need to check if firms 1 and 2 have similar lines of research and both their strength and their competitor's in bringing innovation to the market in that area to justify assessing whether innovation incentives related to future innovation efforts would be diminished.

is enough competitive pressure post-market launch to provide the necessary incentives to ensure that incremental innovation efforts will be undertaken.

The uncertainty of innovation outcomes and the specificities of different sectors and cases are examples of the challenges faced by authorities assessing these cases. Without the ambition to provide final answers to the debate, we attempted in this paper to propose different faces of that innovation competition, while providing insights for how to better assess and build the theory of harm of each case. As propositions for a research agenda, we can list: (i) further developing the capabilities-based assessment, especially regarding evidentiary proxies for the assessing competitive significance of firms regarding innovation capabilities and harm; and (ii) examining sectoral specificities and innovation patterns, understanding that innovation processes are different between sectors and firms. These would be a necessary next step for a viable implementation of the scheme we have presented along in the paper.

Concorrência em inovação em fusões e aquisições horizontais: escolha do *framework* para avaliação da Política de Defesa da Concorrência

Resumo: Este artigo discute a avaliação de fusões horizontais e dano à inovação quando há concorrência em inovação. O objetivo é construir um esquema para a escolha adequada do *framework* de análise, apresentando, para cada situação: mecanismos para identificar concorrência em inovação, para definir mercado relevante e avaliação da competitividade das firmas, identificação das teorias de dano adequadas e evidências. Revisamos a literatura sobre Política de Defesa da Concorrência e Economia da Inovação e utilizamos exemplos da jurisprudência dos EUA e da Europa. Discutimos também brevemente a literatura de gestão estratégica para fornecer insights para a avaliação. Considerando as reduções pós-fusão nos incentivos a inovar como dano à inovação, encontramos diferenças quanto à adequação do passo-a-passo tradicional e desafios para construir evidências considerando três faces da concorrência por inovação, incluindo possíveis combinações destas faces em um mesmo caso de fusão: (i) esforços de inovação incremental no mercado de produto, (ii) esforços em andamento para desenvolver novos produtos e (iii) esforços de inovação futuros. Quando o passo-a-passo tradicional é inadequado, argumentamos em favor do uso de uma avaliação baseada nas capacidades, alterando o passo-a-passo de análise.

Palavras-chave: Defesa da Concorrência, Fusões, Inovação, Capacidades

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