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## **Three Faces of Innovation Competition in Horizontal Mergers: Choosing the Framework for Competition Policy Assessment**

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# Three Faces of Innovation Competition in Horizontal Mergers: Choosing the Framework for Competition Policy Assessment<sup>1</sup>

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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 relevant 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) continuous 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. Given the gaps found in the existing literature, we provide insights to the analysis as steps towards an agenda of capabilities-based merger assessment.

**Keywords: Competition Policy, Mergers, Innovation, Capabilities**

**JEL: L40**

## 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 contínuos 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 de fusões baseada nas capacidades. Considerando as lacunas encontradas na literatura existente, trazemos insights para a análise como passos no sentido de uma agenda de avaliação de fusões baseada nas capacidades.

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

# 1 Introduction

Preserving post-merger innovation is a relevant concern for competition policy.<sup>2</sup> 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 innovation is still open and the authorities have not reached a consistent and consensual approach.

In the USA, as pointed by Kerber & Kern (2014, pp. 24-32), 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 in 1995-2008 innovation aspects were mentioned either in relevant market definition or competitive assessment.<sup>3</sup> The inconsistency, as argued by the authors, 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, as it is just mentioned.<sup>4</sup>

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 (but not all) situations (Budzinski, 2008). Following Schumpeter's seminal ideas (Schumpeter, 1942), in some industries, competition occurs mostly through innovation,

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<sup>2</sup> 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).

<sup>3</sup> Considering both the US Antitrust Agencies: The Federal Trade Commission (FTC) and the Antitrust Division of the Department of Justice (DoJ). Gilbert & Greene (2015) make a similar study for 2004-2014 and find similar results (33.6%).

<sup>4</sup> Gilbert & Greene (2015, p. 1941-1942) also 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.

dynamically, and in an active, instead of passive, way. By definition, innovation effects<sup>5</sup> are possible outcomes of mergers on innovation 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, p.671). It is important to notice that firms which compete through innovation often compete simultaneously on other variables as well, such as prices and quantity. Negative innovation effects (innovation harm) occur through the lessening of innovation incentives and reduction of parallel innovation efforts.<sup>6</sup> The understanding of 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).

As we will discuss in this paper, the conventional approach to merger procedure may be applied to some innovation competition cases with minor changes, but not all. Given the inadequacy of the conventional approach to merger analysis in some cases, authors like 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

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<sup>5</sup> Innovation effects are possible reductions or increases on innovation as a result of mergers.

<sup>6</sup> 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 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). This effect is also present in the rationalization effect in OECD (2018, p. 9) (one of the effects of a merger on innovation): the elimination of duplicative spending on innovation is responsible for enabling the firm to redirect innovation efforts on one hand but reduces the likelihood of that at least one innovation project reaches the market due to fewer parallel innovation efforts. 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 there were diversity arguments.

based mainly in the firms' capabilities to innovate. For these authors, the capabilities of the firms should be considered in relevant 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 mentioned above, there 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<sup>7</sup>. 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.<sup>8</sup> Recently, the Dow/Dupont merger (2017)<sup>9</sup> presented a significantly different approach called by Denicolò & Polo (2018) as the Innovation Theory of Harm (IToH) (Petit, 2017; Denicolò & Polo, 2018) and later called as the four-layer competitive assessment by the European Commission<sup>10</sup> and indicated concerns about harm to innovation in early steps of product development and in the incentives to undertake future innovation efforts.<sup>11</sup>

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<sup>7</sup> The 1992 Merger Guidelines presents the first dynamic aspects to merger assessment, with the relativization of market-shares when innovation is at stake. While 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).

<sup>8</sup> Petit (2018) discusses the evolution of the assessment of innovation effects in the EU merger case law.

<sup>9</sup> Case COMP/M.7932 (2017).

<sup>10</sup> The four-layer competitive assessment consists in assessing a merger according to: (i) price/product competition between incumbent products; (ii) price/product competition between late-stage pipeline products; (iii) innovation competition between pipeline products in earlier stages; and (iv) innovation competition related to capabilities to innovate in certain innovation spaces (European Commission, 2020, p.5-6). The concept of innovation spaces will be further discussed in section 4.

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

This paper's central goal is to build a scheme for the proper choice of analytical framework to be applied to the assessment of horizontal mergers<sup>12</sup> in which there is innovation competition, focusing on understanding the possible theories of harm, the different ways that innovation competition may occur – the faces of innovation competition - and their consequences to the analysis in each case. We assume that the likelihood (or potential) negative innovation effects should be addressed both when traditional 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 negative innovation effects are likely to harm consumers and the competitive process itself, and that it needs to assess the different time horizons in which innovation effects occur, considering short and long-term impacts of mergers. Although we recognize that innovation-related efficiencies – the procompetitive side of merger - should be addressed to have a complete picture of the overall effect on innovation of each case, we focus on looking on negative innovation effects in this paper.

To achieve our 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 above. Two important gaps are identified. First, the literature is not organized in a way that provides a framework to the authorities towards considering which innovation effects need to be investigated in merger cases, as well as which type of assessment and theories of harm need to be applied to proper protect innovation. To address this gap, the paper systematize the literature and propose the faces of innovation competition typology of cases where innovation effects needs to be investigated - (i) continuous innovation efforts in the product market, (ii) ongoing efforts for developing new products and (iii) future innovation efforts - and discuss the adequate merger procedure, specific assessments and type of evidence for each case, as an extension of the typologies proposed by Baker (2007), Katz & Shelanski (2007), Federico, Scott Morton & Shapiro (2020). As we show, these cases are not mutually exclusive and can be assessed in the same merger analysis.

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

We identify that while in some situations the conventional approach properly analyzes harm to innovation with minor changes, in others a different assessment is needed. The second gap is related to the assessment of the latter, as we identify to be the case when innovation efforts are not close to market launch and when there is innovation competition through future innovation efforts. We argue that the capabilities-based assessment is a relevant framework for these situations, connected with the propositions of Gilbert & Sunshine (1995), Katz & Shelanski (2007), Sidak & Teece (2009), Kerber (2017). When reviewing the literature in the capabilities-based assessment, we find the need to develop the approach further, namely the relevant market definition and the assessment of competitive significance and take contributions from the strategic management literature that follows the resource-based approach, which provides important insights, especially to the analysis of cases in which there is no well-structured R&D process and when it regards future innovation efforts. These insights help identify firms that can viably engage in competing innovation efforts, therefore exerting the necessary competitive pressure to be considered as competitors in an innovation market. This effort looks into an alternative theory of the firm to understand the capabilities to innovate, as an attempt to go further in the practical side of the capabilities-based assessment proposition without claiming to exhaust this challenge and relevant subject.

At the end, we point out not only how to identify the faces of innovation competition that may be applied to each merger case and the appropriate assessment for each situation, but present analytical elements to undertake such assessment, such as relevant market definition, the assessment of competitive significance and how the merger affects innovation incentives, including theories of harm and possible evidence, for each case. Cases are used to exemplify along the text.

Three methodological choices are important to be noted before we proceed. First, product innovation is the focus of our analysis, more specifically, innovation that creates new or improved products, even though process innovation is an important topic of discussion. Second, it is also important to acknowledge that improved products are higher quality versions of existing products which emerge from innovation efforts dedicated to



generating vertical differentiation.<sup>13</sup> 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) when referring to innovation efforts, 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 relevant 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 effects in identifying possible negative effects to innovation through reductions on innovation incentives. Section 4 presents the 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 presents the proposed scheme and the concluding remarks.

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<sup>13</sup> Another type of product differentiation is horizontal differentiation, which occurs when the different products cannot be ranked in terms of quality (e.g., a different flavor of ice cream, or even a different color of a bag, etc.).

## **2 Traditional and innovation competition: relevant 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 driving force of competition. This section is devoted to briefly discussing both traditional competition and innovation competition views, how the post-Chicago<sup>14</sup> (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 countervailing efficiencies. In other words, if the net effect of a merger in consumer's welfare is negative<sup>15</sup>, the competition authority will approve it subject to remedies<sup>16</sup> 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

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<sup>14</sup> 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).

<sup>15</sup> See Motta (2004).

<sup>16</sup> Competition policy remedies are conditions imposed by the authority to approve a merger.

policy. And to achieve it, authorities pursue economic efficiency to avoid consumer 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. Increases in prices represent allocative inefficiencies and reduce consumer welfare. 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 usually as the main variable to represent merger effects by the conventional approach, despite also considering a variety of goals, such as product quality and innovation.<sup>17</sup>

The conventional approach presents a well-defined merger procedure to be taken before deciding about the merger potential effect, including: (i) relevant 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 the conventional approach, the relevant market is the *locus* of competition, and to define it, the authorities delimitate its product and geographical dimensions.<sup>18</sup> After defining the relevant market, authorities usually assess market shares and market

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

<sup>18</sup> The most common method to define the relevant market is the Hypothetical Monopolist Test (HMT). If the hypothetical monopolist can implement 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).

concentration as a screening part of the analysis to indicate the competitive significance of the merging parties 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 or increase quality of all 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, diversion ratios and markups of diverted sales may be more relevant as screening to potential price increase pressures than the resulting market share and concentration index.<sup>19, 20</sup> Rivalry and entry conditions are also investigated among other to access the likelihood of anticompetitive effects. Also, countervailing efficiencies are considered to the final conclusion about the overall price effect. To estimate the potential effects on prices, many different quantitative tools may be used, if necessary, most considering the assumptions of the classic oligopoly models (Bertrand or Cournot competition). Furthermore, the usual approach mostly considers short-run price effects, and that competition occurs within the product market.

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<sup>19</sup> 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). Furthermore, UPP and GUPPI models (which measure unilateral incentives to raise prices and are derived from the Bertrand model) are frequently considered as better filters for the potential effect on price imposed by the merger (Farrell & Shapiro, 2010, p. 3-6).

<sup>20</sup> Also, in rapidly changing markets, market-shares can be volatile, as sales can be highly contestable by possible future entrants.

## 2.2 Innovation competition, conventional approach limitations and the capabilities approach

The use of the conventional approach to merger assessment may overshadow 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.<sup>21</sup> 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.

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

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<sup>21</sup> 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.

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.<sup>22</sup> 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 example when it comes to relevant market definition, just as it is for traditional competition with differentiated products. In these cases, competition occurs within a product market, so the Hypothetical Monopolist Test can be undertaken as there is price competition, and the product and geographical dimensions can be defined.

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<sup>22</sup> As argued by Jorde & Teece (1990), Gilbert & Sunshine (1995), Katz & Shelanski (2007), Sidak & Teece (2009). Furthermore, 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.

Moving to the discussion of the assessment of competitive significance, there will be differences in both examples. 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, diversion ratios and markups of diverted sales 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 consumers. 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 relevant market definition when the conventional market definition and assessment of competitive significance is inadequate and innovation competition is at stake. 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).

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 specific new products or processes, and at alternative sources of R&D, including firms which could acquire the necessary assets for R&D in a short period of time. 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). For the purpose of this paper, we follow a similar innovation market definition in cases which demand a capabilities-based assessment, although with important differences which will be discussed further ahead.

Despite the criticism<sup>23</sup>, 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. The framework proposed by the authors is destined to assess the effect of mergers on overlapping ongoing innovation efforts. On one hand, it provides important insights regarding the identification of competitors to such innovation efforts but focuses only on firms which are undertaking such efforts. On the other hand, the assessment of competitive significance proposed by the IMA includes an analysis 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, but R&D expenditures do not have a clear relation with innovation outcomes (Rapp, 1995, p.33-36). Therefore, concentration in R&D is not an adequate measure for the ability of a firm to bring innovations to the market.

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<sup>23</sup> 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).



### **3 Innovation Incentives and harm to innovation**

Adopting a proper framework regarding relevant 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 several 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.<sup>24</sup>

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

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<sup>24</sup> 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).

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 literature,<sup>25</sup> 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.<sup>26</sup>

Even though the debate presents important advances, the models have limited applicability: (i) they usually depend on several hypotheses (Kerber, 2017, p. 7);<sup>27</sup> (ii) they are hard to be estimated (Gilbert, 2006, p.191-200); (iii) there is great variability between different sectors and markets in a number of variables (Cohen, 2010, p. 194).<sup>28</sup> 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 questions, the effect of changes

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<sup>25</sup> 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).

<sup>26</sup> 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 if in the specific sector Schumpeterian rents are higher or lower than the escape competition effects. Other references are Gilbert (2006), Sutton (1998, 2007), Cohen (2010). See Kerber & Kern (2014) for an overview on the literature regarding the inverted U hypothesis.

<sup>27</sup> 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).

<sup>28</sup> Such as demand, opportunity and appropriability conditions. See Cohen (2010, p. 194).

in cost and demand on innovation and the impact of a specific merger between rivals on innovation.<sup>29</sup>

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. 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).

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<sup>29</sup> Given the lack of a clear relation between concentration and innovation, sector/market specific and ex post assessments studies are important tools to develop a better understanding of those markets. The latter are important exercises to check the impact of the merger on innovation. For a review on 14 ex post assessments of the mergers effects analyzed by the European Commission on innovation, check Ormosi, Mariuzzo & Havel (2015).

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, through which firms provide value to the costumers, including price and innovation. So, according to the authors, the internalization of price-related and innovation-related business-stealing effects resulting of the merger 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 innovation-related business-stealing effects are internalized result in harm to innovation (Federico, Scott Morton, & Shapiro, 2020, p. 130-135).<sup>30</sup> 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, as the business-stealing effects tend to be higher. We can conclude that, the innovation diversion ratio, by analyzing the closeness of the innovation efforts by quantifying the

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<sup>30</sup> Jullien & Lefouili (2018, p. 11) call the effect of a merger on innovation incentives as a result of the internalization of a sales externality as the Innovation Diversion Effect and argue that as in some situations the sales externality exerted by innovating firms may have a positive effect on innovation, the direction of the effect may be positive. So, they criticize the view that innovation always divert sales from its rivals, generating a negative externality, present not only in Federico, Langus & Valletti (2017) but in other papers by Federico, such as Federico, Langus & Valletti (2018) and Federico, Scott Morton & Shapiro (2020). For Jullien & Lefouili, the diversion of sales generated by the innovation occurs when innovation results in vertical differentiation, as the creation of a higher quality product in fact should induce sales to divert to the innovator. However, when the results of the innovation efforts materialize in the form of horizontal differentiation, rivals may be benefited. Bourreau, Jullien & Lefouili (2018) propose a variant of the Hotelling duopoly model in which R&D results in horizontal differentiation. They show that price competition is relaxed as consumers of the innovating firm which are less interested in the competitors' product are more attracted to the innovative product. As a result, the competitors increase profit by increasing sales and, potentially, prices (Jullien & Lefouili, 2018, p.13). As we discuss here innovation which results in vertical differentiation, we assume that externalities placed buy innovating firms are negative and result in business-stealing effects.

amount of profit earned by the successful innovator at expense of its rival, is a measure of the strength of the innovation-related business effects.

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 effects 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, p. 364-365).<sup>31</sup>

The second observation is related to the interaction of price and innovation effects. Federico, Scott Morton, & Shapiro, (2020, p. 162-165) alert to the fact that mergers involving innovators result in both unilateral price and innovation effects and also that these effects interact. How this interaction occurs depends on the model used, but their general conclusion is that these effects being accounted for together are likely to be harmful to consumers.<sup>32</sup> However, the assessment of unilateral price effects for cases in

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<sup>31</sup> 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) can increase the ability to innovate, but need to be merger specific in order to be considered as countervailing efficiencies in merger assessment. 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).

<sup>32</sup> Check Federico, Scott Morton, & Shapiro (2020, p. 162-165) for models that simulate the interaction between these effects.

which the innovation efforts being assessed in the merger have not reached the market or have not finished development is hard due to: (i) uncertainty about market launch and (ii) lack of data on substitution patterns (Federico, Scott Morton, Shapiro, 2020, p. 137). Jullien & Lefouili (2018) also make an effort in discussing the interaction between price and innovation effects by discussing the different effects of mergers on innovation. Besides the Innovation Diversion Effect, similar to the assessment of the effects on innovation incentives of the internalization of the business stealing effects and which we consider in this paper to be negative, they also present the Demand Expansion Effect (the post-innovation ease of price competition results in greater margins, and therefore, increases the incentives to innovate to increase demand) – a positive effect on innovation incentives – and the Margin Expansion Effect (the post-innovation ease of price competition results in less production and, therefore, reduces incentives to innovate in margin-enhancing innovation) – a negative effect on innovation incentives. The latter two effects go in different directions and the net effect will depend on which one dominates the other.

For the rest of the paper, given the difficulties in estimating unilateral price effects mentioned above and the lack of a clear net effect of the effects mentioned by Jullien & Lefouili (2018) in the cases mentioned above we will consider only innovation effects.<sup>33</sup> Federico, Scott Morton, & Shapiro (2020, p. 163) also emphasize that given the difficulties of estimation, the theoretical literature can be useful to directly address innovation effects. So, using the business-stealing mechanism or principle is an important first step in assessing harm to innovation, but fully addressing these situations in merger procedure require that the analyst consider the specificities of the different cases in which such effect may occur. The next section looks at the different situations in which there may be harm to innovation, arising from the existence of innovation-related business-stealing effects.

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<sup>33</sup> Which are the ongoing innovation efforts cases which have not finished product development and the innovation competition through future innovation efforts cases.

## 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.<sup>34</sup> 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) apply the mechanism described in the last section. i.e., there are innovation-related business-stealing effects and list three distinct patterns identified in practice. These contributions form the basis of our discussion and will be revisited throughout this section.

The situations where innovation competition occurs exemplified before for relevant 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 (continuous innovation efforts). The second situation - when two or more companies are in a race to enter a new market and are simultaneously undertaking competing innovation efforts – represents a case of an overlap between ongoing innovation efforts towards developing a new product. We can also add to this category another possibility: a merger 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 merging parties. In this category we need to consider both cases in which such efforts are close to market launch and in earlier stages, which will be assessed differently. 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

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<sup>34</sup> 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).

the necessary capabilities and similar lines of research (a necessary condition for engaging in innovation efforts) provide competitive pressure on each other. The three examples represent what we will call the different faces of innovation competition: through continuous innovation efforts in the product markets, through ongoing innovation efforts for new products and through future innovation efforts.<sup>35</sup> In the same merger, all three faces of innovation competition may be at stake, demanding assessment from potential innovation effects by Competition Policy, but with different approaches, as we will argue.

Although innovation competition may occur in diverse ways, harm to innovation occurs through two channels. Following Kokkoris & Valletti (2020, p. 233-234), we may list post-merger reductions in innovation incentives: (i) related to a specific innovation effort, resulting in a possible delay and/or interruption of such effort and (ii) related to new innovation efforts, resulting in less innovation efforts in the future. As we will discuss, in

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<sup>35</sup> The typology for the faces of innovation competition follows mostly Federico, Scott Morton, & Shapiro (2020), but also Katz & Shelanski (2007) and Baker (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 continuous innovation efforts 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 category is similar to the first canonical case in Katz & Shelanski (2007), in the situation in which a new product is created, and also similar to 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 to the market with competing innovation efforts matches the winner-take-all/winner-take-most case in Baker (2007) and Katz & Shelanski (2007). Finally, the innovation competition through future innovation efforts is very similar to the overlaps in capabilities category in Federico, Scott Morton, & Shapiro (2020). It is important to notice that Federico, Scott Morton & Shapiro (2020) add a third pattern which is the acquisition of potential competitors by dominant firms. They argue that a target firm with a pipeline project and capabilities to grow into a rival to a dominant firm could be acquired by the latter without a proper assessment of its capabilities due to the lack of past overlaps. Even though the concerns presented by the authors are reasonable, this specific situation fits the faces of innovation competition framework we present here, when there is ongoing or future innovation efforts. Section 5 contributes to the debate on the assessment of competitive significance which could be useful to assessing these cases.



each of the faces of innovation competition either one of these two channels will be the source of harm to innovation.

The following subsections addresses each of the three faces of innovation competition, presenting 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 case law to illustrate when it is possible.

#### **4.1 Innovation competition through continuous innovation efforts in the product market**

In some product markets, innovation efforts may be undertaken towards creating newer and better versions of existing products. Whenever there are continuous innovation efforts in a product market as a strategy for competing, we can say that this market presents traditional competition and innovation competition simultaneously. It is important to add that we are not including under this category radical innovations which create an entirely new product or market, but rather situations in which at least one of the firms in the market engages in continuous innovation efforts, towards both incremental and radical innovations as long as they are not being undertaken towards creating a new product market.<sup>36</sup>

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

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<sup>36</sup> According to Schilling (2013, p. 46-47) incremental innovations are relatively minor changes, while radical innovations are very new and different from prior products. Here we are discussing the innovative behavior of firms so both types may be at stake as long as they do not create a new market. However, as incremental innovations are more frequent and less likely to create a new product market, it will be addressed more often in this face of innovation competition.

discusses mostly 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 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 product markets which can be applied here: if two product market competitors merge and the competitive pressure is reduced, they may be less willing 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 harm to innovation is the reduction and the interruption in the introduction of innovation within the product market in the future. Harm occurs through the second channel listed by Kokkoris & Valletti (2020), as the concern is related to future innovation efforts instead of a specific ongoing product development. 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 the source of harm is the removal of a continuous innovator and given that 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.<sup>37</sup> Evidence on the

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<sup>37</sup> A maverick is a firm which plays a disruptive role in the market. 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. 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).

profitability of the parties' diverted sales to the innovator (current and expected) also provides an indicator of harm (p. 141). Finally, in the absence of effective rivalry, i.e., if the merger gets together two out of a few competing firms engaging in innovation efforts, harm to innovation tends to be higher.<sup>38</sup>

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 important evidence for this analysis. Second, incremental innovation, frequent in these cases, 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 continuous innovations to the market. As we are considering innovation in 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 case<sup>39</sup> 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.<sup>40</sup> 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

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<sup>38</sup> The reasoning for such an effect lies in the notion that a firm which engages in continuous 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.

<sup>39</sup> Case 1:11-cv-01560.

<sup>40</sup> 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).

an important frequent innovator.<sup>41</sup> In *AT&T-Mobile*, the DoJ considered that the merger would not only result in higher prices and less investment, but also less innovation and variety.<sup>42</sup>

## **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. Harm to innovation may occur through the second channel cited by Kokkoris & Valletti (2020), a delay and/or interruption of a specific innovation effort.

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. However, 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. By using the pipeline terminology, we are not reducing this face of innovation to the situations where there is a well-structured R&D procedure, although we know that these two different forms of innovation have different practical consequences and challenges.

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<sup>41</sup> 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).

<sup>42</sup> 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.

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 assessment, as the introduction of the new product is just a matter of time and the firm is already a potential competitor, so there is no possible harm to innovation<sup>43</sup> (Katz & Shelanski, 2007, p. 65-66). 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). 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 and avoid harm, i.e., a delay and/or interruption in these efforts. The key factor to decide whether the case can be scrutinized through the conventional assessment used in traditional competition or not is precisely whether proper innovation incentives are needed to finish the development of the product. For the rest of this subsection, we will focus our analysis on harm through a possible delay and/or interruption of specific innovation efforts.

Before moving on, a specific type of case in which different faces of innovation competition are at stake is worth mentioning. Suppose a merger in which the parties have 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 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 is enough competitive pressure post-market launch to provide the necessary incentives to ensure that continuous innovation efforts will be undertaken.

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<sup>43</sup> It is important to add that if there are continuous innovation efforts in the relevant product market in which the new product ready for launch will compete, there may be innovation effects related to the first face of innovation competition.

When it comes to the assessment itself, this face of innovation competition may be divided into two categories: when there is an existent product market and when the overlapping ongoing innovation efforts are directed towards creating a new product market. In both, considering that innovation incentives are needed to finish product development, a capabilities-based relevant market definition and assessment of competitive significance is necessary to accurately analyze merger effects, as there is competition in innovation outside the product market. 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. When a product market exists, the innovation market will exist in parallel and both price and innovation effects will have to be addressed. The innovation market must consider all these participants and the competitive 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 examples of sources of barriers to entry in the innovation market.

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 existence of business-stealing effects. Besides, another decisive factor for the need of enforcement is the absence of effective 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). We will now consider the two categories separately.

#### **A) Existent product markets**

When the innovation efforts at stake are related to an existent product market we may have either a *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 or a *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. 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, a *product-to-pipeline* overlap. 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 higher the profitability of the sales of the current incumbent product that would be diverted to the innovation are, the higher the business-stealing effects are and the less incentive the merging entity has to continue developing the pipeline project. The profitability of these sales can be assessed by looking at evidence (i) on both current and expected future profitability of the incumbent product, along with the (ii) closeness between this incumbent product and the pipeline project, (iii) expected duration of the overlap in the product market when the pipeline reaches the market and (iv) the remaining time of patent protection (when applicable). Furthermore, it is important to notice that a more concentrated product market implies that diverted sales to the innovation are more profitable, increasing business-stealing effects. 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 (Federico, Scott Morton, & Shapiro, 2020, p. 140-142). As mentioned, the time to market and the absence of effective rivalry are also decisive factors to assess innovation effects in this case. It is important to recall that as there is a product market, the authorities need to also consider price effects.

An example is 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, infliximab biosimilar drug (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. 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 rivalry, reason that made the Commission require no remedies in that case (European Commission, 2015).

## **B) Non-existent product markets**

As in the previous case, assessment of pipeline-to-pipeline overlaps towards creating a new product market 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. 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. Once again, the three factors mentioned above (the substitutability between the parties' products in the future product market, the time to market and the absence of effective rivalry) have important roles in assessing the innovation effects of these cases. However, in this situation the authorities will not need to account for price effects, as there may be only innovation effects. A special situation in this category – following the second canonical case presented by Katz & Shelanski (2007) - is the innovation-based race to market dominance.<sup>44</sup>

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 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.

About the two categories mentioned in this subsection, 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 examples presented from the case law 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: (i) 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; (ii) there can be estimates of time to market based on the

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<sup>44</sup> 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).

phase of the R&D process; and finally, (iii) it is easier to know not only which other competitors there are, but also the phase in which their pipeline projects are. So, building a theory of harm to innovation based on pipeline projects is easier on certain industries.<sup>45</sup> 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 could 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. However, uncertainties about the expected success to be reached by the project is hard to overcome. Section 5 briefly discusses some alternatives for such evidence.

Besides, it is possible that the overlaps 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.<sup>46</sup>

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

<sup>46</sup> It is important to add that by steps which precede pipeline stages we are still referring to overlaps in specific innovation efforts, which demand assessment to avoid post-merger reduced incentives to keep the

Concluding, in both cases in which there are overlaps between ongoing innovation efforts, when there is and when there is no existent product market, 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 continuous 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., relevant market definition needs to include all firms with competing pipelines and capabilities directed to the development of that particular product. In the existent product market case, the effects of the product market need to be considered, as the profitability of the diverted sales to the innovator makes it more likely that the merger results in reduced innovation incentives (Federico, Scott Morton & Shapiro, 2020, p. 141). Harm to innovation may occur through the reduction of innovation incentives, which may result in the delay or interruption of ongoing innovation efforts, the first channel of harm to innovation listed by Kokkoris & Valletti (2020). Harm to specific ongoing innovation efforts also needs 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 when 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 or competing in the product market, there are business-stealing effects placed by the firms on each other, as they face the perspective of losing sales to rivals when they introduce new products in the future (Federico, Scott Morton, & Shapiro, 2020,

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development of the project. We are not referring to the effect of overlaps in lines of research which could reduce innovation incentives related to all the line of research. The latter effect is discussed in subsection 4.3.

p. 146-147). A merger between two or more of those firms is often undertaken to acquire capabilities and competences which could be procompetitive. However, by internalizing these business-stealing effects, 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.<sup>47</sup> 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, as in the first channel of harm to innovation by Kokkoris & Valletti (2020). However, unlike in the continuous innovation efforts in the product market case, firms are not product market competitors. 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 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 yet. 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 due to overlaps in capabilities may sound especulative 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)

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<sup>47</sup> This theory of harm was explored in Dow/Dupont (2017). Check Petit (2018) and Todino, Walle, Stoican, (2019) for the literature which discusses this case and its theories of harm.

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 evidences 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. In the next section we will discuss alternatives for other cases in which innovation does not occur through a structured R&D process, but the assessment will only succeed in finding evidence of harm regarding future innovation efforts in sectors in which the past provides a good overview of the firms' ability in engaging in innovation efforts.

*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.<sup>48 49</sup>

Assessing the effects of mergers in future innovation efforts is a hard task, but one that must be faced as not assessing such effects leaves a risk that important harm to innovation arising from mergers is overlooked, affecting innovation incentives over a long period of time. One might argue that such assessment could be not only speculative, but out of the competition authorities' reach, as it looks to the effects of a merger on a very long time frame, more specifically, to an unforeseeable time horizon. However, it is important to

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<sup>48</sup> The European Commission (2017, p. 485) states: "The concern here is that in the medium and long-term, because of the lack of rivalry incentives to innovate, the merged entity would pursue less discovery work, less lines of research, less development and registration work and ultimately bring less innovative AIs to the market than the merging parties would have done absent the transaction."

<sup>49</sup> According to Todino, Walle, & Stoican (2019), the EC merger procedure went through a process of gradual change from its usual assessment of harm to innovation, based on an overlap of an incumbent product and a close-to-market pipeline project, to the assessment presented in *Dow/Dupont*.

recall that competition policy intervention itself is justified by the inefficiencies which arise from excessive market power. As Motta (2004) argues, market power may generate allocative, productive and dynamic inefficiencies. The last one is often presented as an alternative to static allocative efficiency, which is an optimal intertemporal Pareto-efficient allocation of resources (Baumol & Ordover, 1992). Assessing dynamic inefficiencies partially solves the inadequacy of short run allocative efficiency to address innovation competition cases by capturing the effect of the merger on a longer period, which includes the finishing the development of ongoing innovation efforts. Some authors go further and consider that this approach does not capture the effect of mergers in incentives to undertake future innovation efforts: as Possas (2004, p. 88) argue, some mergers may affect innovation in an unknown and unforeseeable time horizon by the time of the merger, due to the uncertainty of future outcomes. Possas suggests the adoption of the concept of selective efficiency<sup>50</sup>, in which a broader goal of protecting the role of the market as a selector of innovations may substitute the normative goal of allocative efficiency pursued by traditional merger assessment (Possas, 2004, p. 91-93).

As discussed throughout this section, continuous innovation efforts in the product market and close-to-market overlapping product-to-pipeline or pipeline-to-pipeline cases can be assessed through the traditional 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 delimitating 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. Finally, when there are

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<sup>50</sup> Selective efficiency can be defined as “...the hierarchical capacity of the selection process, reflecting the degree to which the filtering of innovations by the market correlates with its ordering, as far as possible objective, in terms of progress indicators along an innovative trajectory.” (Possas, 2004, p. 91). Free translation of the original quote in Portuguese.

continuous innovation efforts in the product market and a product-to-pipeline overlap regarding an existent product market, both price and innovation effects will need to be assessed.

## 5 Capabilities-based merger assessment

As the traditional assessment is inadequate to assess competition in innovation markets, starting from the relevant market definition<sup>51</sup>, 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. The IMA is a first effort on such an assessment but has limitations. First, for market definition, it includes in the innovation markets firms which have overlapping R&D activities and firms with capabilities to supply competing products. Second, as briefly discussed in subsection 2.2, the use of concentration in R&D expenditure is not an adequate measure for the ability of the firm. A proper capabilities-based assessment needs to undertake an innovation market definition includes non-R&D innovation efforts and, more importantly, includes firms which not only have capabilities to engage in competing innovation efforts, but that can viably do so in order to screen which firms actually exert competitive pressure on the parties and assess their competitive significance.

Following Kerber (2017, p. 13), and closely related to the basic idea of the IMA, we need to discuss how to identify viable players which compose the innovation market and assess their competitive significance. 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

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<sup>51</sup> The Hypothetical Monopolist Test could not be used correctly as there is no product market yet and uncertainty regarding future outcomes of innovation efforts.

challenges identified throughout the text, namely assessing the competitive significance and evidence to build the theory of harm in industries which innovation is not generated by a well-structured R&D procedure. These are the challenges for building a capabilities-based assessment.

This section rediscusses relevant market definition and the assessment of competitive significance under a capabilities-based framework by undertaking a theoretical discussion about an alternative theory of the firm to provide insights for the assessment. We suggest using specific concepts taken from the literature to identify competitors and their significance. Furthermore, we also debate the challenges of practical application by discussing the Dow/Dupont case.

## **5.1 Resource-based theory 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: a firm which has more resources to enter a specific market 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.<sup>52</sup>

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<sup>52</sup> For a review on the discussions on the theory of the firm and the innovative firm, see Paranhos & Hasenclever (2017).



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 invite 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.<sup>53</sup> 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.<sup>54</sup>

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 on the same lines of research as the merging parties. Prahalad & Hamel suggest looking at three factors to identify core competences: it must provide access to a wide variety of

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<sup>53</sup> See Schilling (2013) for conceptual discussion.

<sup>54</sup> 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).

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 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 when there are overlaps in capabilities and the past provides a good overview of the firms' ability in innovating. 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, creating a synergy which could be 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 to conclude whether entry is way or not. Switching costs, transaction and learning costs, as well as network effects are

important factors (OECD, 2002, p. 27-28).<sup>55</sup> More generally, the necessary capabilities for initiating innovation efforts vary among sectors and industries and they may potentially make entry harder.<sup>56</sup> Furthermore, in industries 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 information which helps acknowledging competitors. Those factors make finding overlapping capabilities easier when compared to other sectors which do not present well-defined R&D procedure.

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:

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<sup>55</sup> 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).

<sup>56</sup> 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).

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. Other players act only in R&D and need to partner up to bring the new products to markets or work in small scales. Only those 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 to identify the strength of companies in both stages of R&D (discovery and development): (i) patent shares and (ii) new active ingredient shares. 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.<sup>57</sup> 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 cumulateness 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 cumulateness 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.

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<sup>57</sup> 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.

The assessment presented in this case is also applied to Bayer/Monsanto (2018) and AbbVie/Allergan (2020) and under the name of four-layer competitive assessment.

## 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 relevant 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, which means when it is necessary to define innovation markets and the ability to compete through innovation is not derived from higher market shares. We also presented the appropriate theories of harm to innovation for each case and discussed under the innovation incentives literature, including the business-stealing effects mechanism, the resource-based theory, and evolutionary contributions to build a list of 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 different faces of innovation competition: through continuous innovation efforts in the product market, through ongoing efforts to develop new products (existent and non-existent product market cases) and through future innovation efforts, respectively. Thus, we proposed a taxonomy of the three faces of innovation competition taking the contributions of Federico, Scott Morton & Shapiro (2020), Katz & Shelanski (2007) and Baker (2007) as a starting point.<sup>58</sup> These three faces

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<sup>58</sup> We classified those cases, from the examination of sort of cases where the innovation-related business-stealing effects mechanism is at stake (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 continuous innovation efforts; (ii) when the merging parties present overlaps in ongoing innovation efforts for developing new products with other ongoing innovation efforts or incumbent products; and (iii) when the merging parties present overlaps in capabilities and future innovations efforts may be harmed.

may be present in a single merger case. A practical example of looking at different categories of harm to innovation is the four-layer competitive assessment presented in Dow/Dupont (2017): besides the two price-related layers of assessment, the EC looks at innovation competition related to pipelines and overlaps in capabilities. 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 counteract such harm when looking at the net merger effect on innovation.

Furthermore, on one hand we argued that some of these cases may be assessed through the traditional analysis: when innovation competition occurs in the product market (through continuous innovation efforts) or when new products are close to market launch. In the latter case there is no expected negative effects on innovation if there is no continuous innovation efforts needed as well: given that the product is ready for market launch and does not demand further innovation incentives to finish product development, a possible discontinuation of the product as a result of the merger may generate another effect, such as a price effect or even a reduction of diversity in the market. Challenges faced by the agency in these cases are similar to the ones in differentiated products mergers. On the other hand, we also argue that when there are ongoing innovation efforts for new products not close to market launch and when there are overlaps in capabilities, a different assessment is needed as the conventional approach is both unfeasible and inadequate. Thus, we proposed using a capabilities-based assessment in these cases, as it will be necessary to define an innovation market as well. By 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 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 - Faces of innovation competition and potential harm to innovation assessment**

Face of Innovation Competition	Source of innovation-related business-stealing effects	Market definition and Assessment of Competitive Significance	Channel of Harm to Innovation	Evidence
Continuous Innovation Efforts in the product market	Overlap in the product market and at least one of the parties undertakes continuous innovation efforts	Traditional	Less innovation efforts in the future	Substitutability degree between the parties' products Evidence on current and expected profitability of diverted sales between the merging parties History in bringing innovation in markets Frequent Innovator or innovation maverick Absence of effective rivalry (engaging in innovation efforts)
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	Traditional (if close to market launch)	No Innovation effect, unless the market demands further innovation efforts	In the case in which the market demands further innovation efforts, evidence is similar to the continuous innovation case
	Existent product market: 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) + traditional	Delay and/or interruption of innovation efforts	Substitutability degree between the parties' products Absence of effective rivalry (rivals engaging in competing innovation efforts and/or with similar Core Capabilities and Core Competences and cumulative innovative successes) Time to market Evidence on current and future profitability of the incumbent product (if product-to-pipeline)
	Non-existent product market: Overlap between efforts to develop new products	Capabilities-based (if not close to market launch)	Delay and/or interruption of innovation efforts	Expected duration of the overlap between the two products in the market (if product-to-pipeline) Remaining time of patent protection (if product-to-pipeline)
Future Innovation Efforts	Overlap in capabilities	Capabilities-based	Less innovation efforts in the future	Overlapping lines of research History in bringing innovation in the area Absence of effective 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 results 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.<sup>59</sup>

The uncertainty of innovation outcomes and the specificities of different industries 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 evidence for assessing competitive significance of firms, for innovation capabilities and for building theory of harm to innovation; (ii) examining sectoral specificities and innovation patterns, understanding that innovation processes are different between sectors and firms, also including the possible synergies to be expected in each case. These would be a necessary next step for a viable implementation of the scheme we have presented along in the paper.

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<sup>59</sup> 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 continuous 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.



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