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In this paper, we review recent studies on the impact of mergers on investments. We begin by examining how mergers among competing incumbents influence firms' incentives to develop new products and undertake cost-reducing or quality-enhancing investment. We then analyze how an incumbent's acquisition of an innovative entrant affects the investment incentives of both parties. Next, we discuss the effects of vertical mergers on the investment decisions of both upstream and downstream firms. Finally, we highlight several policy-relevant insights from the literature and suggest directions for future research.

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1 Introduction

The long-standing debate on the relationship between competition and investments has recently been revived due to the growing interest of competition authorities in the so-called "non-price effects" of mergers.[1] For example, the European Commission has taken actions in several merger cases based on an adverse impact on R&D investments. Notable examples include the mergers between Medtronic and Covidien (2014), Novartis and GSK (2015), and Pfizer and Hospira (2015) in the pharmaceutical and medical device sector, as well as those between Dow and DuPont (2017), Bayer and Monsanto (2018), and Bayer and BASF (2018) in the agrochemical product industry. All of these mergers have been cleared under the condition that remedies that address concerns about innovation incentives are implemented. Similar concerns have been raised over the last few years in the context of digital markets, where incumbents have engaged in a large number of acquisitions of innovative startups.[2]

The impact of mergers on innovation has also been a central issue in the ongoing debate on European competitiveness. For example, in a recent report for the European Commission, Draghi (2024) recommends revising the Commission's merger guidelines to clarify how the impact of mergers on innovation incentives is assessed and to allow for an "innovation defense". According to the report, such a defense could be justified in certain sectors by the need to pool resources in order to compete at the global level.

In this paper, we review recent studies on the impact of mergers on investments. While investments may take several forms, the bulk of the existing literature focuses on R&D, reflecting the central role of innovation incentives in merger control. Accordingly, R&D investments constitute the main (though not exclusive) emphasis of our paper.[3]

The literature on the effects of competition on R&D investments draws on two seminal contributions that offer seemingly opposite views. The first perspective, put forward by Schumpeter (1942), posits that market power (and firm size) spur innovation. The logic behind this assertion is that firms with market power have a stronger incentive to innovate because of their greater ability to appropriate innovation rents (owing to low competitive pressure). The second viewpoint, articulated by Arrow (1962), argues that a monopolist has weaker incentives to innovate compared to a firm in a perfectly competitive environment, due to the so-called *replacement effect* (Tirole, 1988). This effect refers to the idea that a monopolist makes profits even if it does not innovate, whereas a firm in a perfectly competitive market makes profits only if it innovates (thus becoming more

[1] See, e.g., Gilbert and Greene (2014), Federico (2017), Jullien and Lefouili (2018), Petit (2019), and Federico et al. (2020).

[2] See, e.g. Fumagalli et al. (2025).

[3] There are at least two major differences between investment in R&D and investment in physical capital (e.g., infrastructure). First, the outcomes of R&D investment are inherently more uncertain and less predictable. Second, spillovers are more salient in the case of R&D investment.

efficient than its rival). Consequently, a firm operating under perfect competition has more to gain from innovating than a monopolist. As a preamble, it is important to note that the Arrowian and Schumpeterian views do not contradict each other (Shapiro, 2012). The former essentially states that greater competition *before* innovation raises firms' incentives to innovate, whereas the Schumpeterian view contends that greater competition *after* innovation reduces innovation incentives.

Several scholars have investigated the Arrowian and Schumpeterian effects from both theoretical and empirical perspectives.[4] Most notably, in a seminal contribution, Aghion et al. (2005) build a model that incorporates both types of effects and show that the relationship between competition and innovation is non-monotonic. Specifically, the authors find that the combination of the Arrowian and Schumpeterian effects lead to an *inverted-U relationship* between competition and innovation.

The above literature has primarily relied on two measures of competition intensity: the number of competitors and the degree of substitutability between products. However, neither of these measures captures a key feature of mergers: the ability of merging firms to coordinate their decisions. This led to the emergence of a new literature that examines the specific effects of horizontal mergers on investments. This literature consists of two strands corresponding to two distinct policy debates: one focusing on the impact of mergers between incumbents on post-merger investment incentives and the other exploring the effects of an incumbent's acquisition of an innovative entrant on pre- and post-merger investment incentives. In parallel, another body of literature has investigated the effects of vertical mergers on investments.

In Section 2, we examine the effects of horizontal mergers among incumbents on investments. We first provide an overview of the main theoretical contributions, distinguishing between investments in new products, cost-reducing investments, and quality-enhancing investments. This distinction is relevant, as some of the mechanisms through which mergers affect investments operate only for certain types of investments. To illustrate this, consider two rival firms competing in both prices and investments. If they invest in cost reduction, a firm's investment affects its rival's profit only indirectly, through the price changes it induces. By contrast, a quality-enhancing investment by one firm also has a direct impact on its rival's profits: even if prices remain unchanged, it negatively affects the rival's demand. As a result, the externalities associated with these two types of investments—and hence the effects of their internalization through a merger—differ. We complement our theoretical discussion with a review of (some of) the empirical evidence

[4]For theoretical contributions on the effect of competition intensity on investments, see e.g., Vives (2008); Belleflamme and Vergari (2011); Schmutzler (2013); Chen and Schwartz (2013); Marshall and Parra (2019). For empirical contributions see e.g., Askenazy et al. (2013); Hashmi (2013); Correa and Ornaghi (2014); Hashmi and Biesebroeck (2016); Beneito et al. (2015, 2017); Jeanjean and Houngbonon (2017); Elliott et al. (2025); Guiffard et al. (2023).

on the effects of horizontal mergers on investments, starting with aggregate studies and then discussing sector-specific studies.

In Section 3, we discuss the impact of acquisitions of innovative entrants by incumbents on the investment incentives of both the acquired and the acquiring parties. The existing literature has shown that incumbents can have incentives to stifle competition by acquiring emerging competitors and halting their innovative projects. This practice, termed a *killer acquisition* (Cunningham et al., 2021), is anti-competitive because its sole objective is to reduce future competition. However, permitting the acquisition of innovative entrants may also have positive effects on competition and innovation. In particular, the prospect of acquisition may offer an innovative entrant incentives to invest in entering the market in a situation where, absent the possibility of acquisition, entry would not be profitable. This mechanism is often referred to as *entry for buyout* (Rasmusen, 1988) or *innovation for buyout* (Cabral, 2018).

In Section 4, we discuss how vertical mergers affect investment incentives. A central issue in the literature is how vertical integration affects investment behavior through its impact on hold-up. Vertical integration mitigates hold-up issues between the merging parties, thereby enhancing their incentives to invest. However, recent studies also show that vertical integration can create hold-up problems for the downstream rivals of the merged entity, potentially reducing their investment.

In Section 5, we draw several policy insights from the literature and outline directions for future research.

2 Horizontal mergers between incumbents

In this section, we examine the effects of horizontal mergers between incumbents on investments. We begin by reviewing theoretical contributions and then turn to empirical studies.[5]

2.1 Theory

In this section, we distinguish between different types of investments and organize the discussion as follows. First, we examine the effects of horizontal mergers between incumbents on firms' incentives to introduce new products. Second, we consider their impact on incentives to reduce (marginal) production costs. Third, we review studies on how horizontal mergers affect incentives to improve the quality of existing products. Fourth, we

[5]A recent literature analyzes common and cross-ownership and their impact on innovation (López and Vives, 2019; Nevrekar, 2022; Li et al., 2023; Antón et al., 2025; Shelegia and Spiegel, 2024). Common and cross-ownership can be thought of as "partial mergers". A review of these studies is beyond the scope of this paper.

discuss papers that adopt general approaches allowing for both cost-reducing and quality-enhancing investments. Fifth, we examine recent work analyzing the effects of mergers on innovation in dynamic settings. Finally, we consider studies that explore how horizontal mergers affect the diversity and direction of innovation.

2.1.1 Investments in new products

Federico et al. (2017) study the effects of a merger on product innovation. They consider a market in which several identical research labs compete to discover a new product (e.g., a treatment for a disease). Because the outcome of research is uncertain, the number of successful labs is random, and competition among several products reduces profits. The authors assume that when there are three or more successful products, all profits are eroded. An investor can only expect positive profits if it is the sole successful inventor or if there is only one other successful inventor.

If a merger between two research labs takes place, the two research units remain separate and are coordinated by the merged entity. Under the assumption that the merged entity would continue to invest equally in the two units, the authors show that the merged entity invests less in R&D than the independent labs. The mechanism is as follows: unlike competing labs, the merged entity internalizes the cannibalization of sales that occurs if both labs succeed simultaneously. As a result, the merged entity has lower incentives to invest than two competing labs. The authors also show that the merger raises non-merging rivals' innovation efforts, and that it leads to a decrease in total industry efforts if and only if the industry is sufficiently concentrated. Finally, they find that a merger harms consumers.

Denicolò and Polo (2018) show that the central result of Federico et al. (2017)—that the innovation efforts of merging firms always decrease after a merger—relies on the assumption that the merged entity finds it optimal to maintain two research labs after the merger. However, the merged entity may instead want to shut down one of the two research units and concentrate its resources on the other. The rationale is that, under competition, firms may succeed simultaneously in innovation, leading to innovation duplication and cannibalization of sales. Because the merged entity would internalize this externality, it may find it optimal to reduce its R&D effort in one research path while increasing it in another. The authors show that whether the merged entity has such an incentive depends on the returns of R&D. Specifically, if the R&D technology involves little decreasing returns at the research unit level, the merged entity will concentrate all its efforts on one research unit. The authors also find that, in this case, the merger (weakly) increases the probability that an innovation is achieved.

D'Annunzio et al. (2025) study the effects of a horizontal merger on incentives to introduce new products—requiring R&D investments—in a setting with (potentially) hor-

izontally differentiated products. They first consider an industry with two symmetric firms merging to monopoly, where each firm owns a research lab and the probability of successful innovation depends on the amount invested in R&D. They show that, absent spillovers and synergies, a merger to monopoly raises innovation if and only if the merged entity's incremental gain from a second successful innovation is greater than the individual duopoly profit earned when both firms successfully innovate. Applying this result to a Salop model with quadratic costs, they find that a merger raises innovation if products are not too differentiated. When the merger leads to less innovation, it unambiguously harms consumers. When it leads to more innovation, the impact on consumers is *a priori* ambiguous. In this case, the authors show that the shape of the R&D cost function plays a role in determining the effect of the merger on consumer surplus. In their Salop application, they find that a merger to monopoly harms consumers except for a small range of parameter values, in which it benefits them.

The authors then extend their analysis to a symmetric triopoly setting and investigate the effects of a 3-to-2 merger on the merging firms' and their non-merging rival's innovation efforts, again in the absence of spillovers and synergies. They show that equilibrium innovation efforts may increase for the merging firms, for the non-merging rival, or for both, but never for neither. They also find that the presence of an outsider may overturn the merger's direct impact on the merging firms: their equilibrium innovation efforts can decrease even when their return from innovation increases for a *given* outsider innovation effort. Turning to consumer surplus, the authors find that 3-to-2 mergers always harm consumers in their simulations in the Salop model. Finally, the authors analyze the effects of synergies (in R&D and production) and different types of remedies on post-merger innovation efforts.

A common feature of the papers discussed above is that the *replacement effect* does not arise, as innovations do not cannibalize existing products. By contrast, this effect is present in settings involving cost-reducing or quality-enhancing investments, which are examined in the next two subsections.

2.1.2 Cost-reducing investments

Motta and Tarantino (2021) examine the impact of a horizontal merger on cost-reducing investments. They consider a market where firms produce differentiated products and compete in prices and investments,[6] and abstract away from (involuntary) R&D spillovers and merger-induced R&D synergies. To isolate the effect of the merger on the merging firms' incentives to invest, they first focus on the case in which two duopolists merge,

[6]In the main model, they consider a market in which firms make their decisions on prices and investments simultaneously. They also consider an extension in which decisions on prices and investments are made sequentially.

thereby giving rise to a multiproduct monopolist. They find that the merger leads to higher prices relative to the case with independent firms. The resulting increase in prices reduces quantities, which in turn lowers the returns from cost-reducing investments, leading to a reduction in investment effort. Therefore, in this setting, the merger has a negative impact on the merging firms' incentive to invest and consumer surplus.

The authors then turn to the case where two firms in an industry with at least three firms decide to merge. They show that, in this case, the merger reduces competition between the merging and non-merging parties, which results in an incentive for non-merging parties to increase their prices. As the prices of non-merging parties increase to a lesser extent than the merging parties, this generates higher demand, which increases the return from cost-reducing investments. This leads to opposite effects on merging and non-merging parties' incentives to invest, with the former being negative and the latter being positive. The overall effect of the merger on the industry-wide level of investments is therefore ambiguous in principle. However, the authors find that this effect is negative under some commonly used model specifications. They also find that a merger leads to a decrease in consumer surplus.

Baranes and Vuong (2021) show that the assumption of symmetry in initial production costs across firms plays a role in the findings of Motta and Tarantino (2021). Specifically, they extend the latter's analysis to a market with two symmetric firms considering to merge and an outsider firm with a lower cost. They show that the merger leads to a decrease in the merging firms' investment level and an increase in the outsider's investment level. Moreover, they find that if the outsider's initial cost advantage is sufficiently large, the resulting increase in its investment can more than offset the reduction in the merging firms' investment. Consequently, the merger can spur total investments and, in some cases, raise consumer surplus.

The impact of mergers on cost-reducing investments is also analyzed by Mukherjee (2022), who extends the model by Federico et al. (2017) to a setting in which the payoffs when innovation fails are not equal to zero (which implies that the Arrow replacement effect is present). The author considers a simple model of quantity competition à la Singh and Vives (1984). The two sellers can invest in R&D which, with some probability, results in a lower marginal cost of production. As in Federico et al. (2017), the author assumes that the probability of failure in innovation is log-convex in R&D investments, which implies that the merged entity would not shut down one of the two labs after the merger. However, unlike Federico et al. (2017), the author implicitly assumes the existence of R&D synergies in his model: if the sellers merge, it is sufficient that one of the two labs succeeds in developing an innovation for both sellers to benefit from reduced marginal costs of production.[7] Comparing the level of investments without and with a

[7]Moraga-González and Motchenkova (2026) show that, absent synergies and spillovers, it is not possible

merger, he shows that R&D investments can be either higher or lower with a merger. If R&D investments substantially lower marginal costs and competition is intense, there is a significant business-stealing effect for the firm that succeeds in innovation when the firms are independent relative to when they are merged. In this case, the merger reduces R&D investments in process innovation. If either competition intensity is low or marginal costs before R&D are not too high, the business-stealing effect is relatively weak and, as a result, a merger stimulates investments.

2.1.3 Quality-enhancing investments

Investments that aim to enhance product quality differ critically from cost-reducing investments. Specifically, the latter affect rivals only indirectly through the effect they have on final prices. In contrast, quality-enhancing investments also have a direct effect on rivals because a higher-quality product diverts sales from rivals (even if prices remain unchanged). The presence of direct and indirect effects generates more complex interactions between prices and investment decisions than for cost-reducing investments. In what follows, we review studies examining how mergers affect quality-enhancing investments.

Federico et al. (2018) study the effects of horizontal mergers on firms' incentives to invest in quality-enhancing innovation and consumer surplus in a symmetric oligopoly. Abstracting away from spillovers and synergies in their baseline model, the authors identify two channels through which a merger affects the merging firms' incentives to innovate—the *price coordination channel* and the *innovation externality channel*. First, a merger internalizes the negative pricing externality that the merging firms exert on each other in the absence of a merger. This raises both their pre-innovation and post-innovation profits, thereby affecting the gains from innovation. While the sign of this effect is *a priori* ambiguous, it is positive for all the specific demand functions used in the authors' simulations. Second, a merger internalizes the negative innovation externality that each merging firm imposes on the other. This effect is unambiguously negative.

The authors first present separate analytical treatments of the two channels and then study their interplay through numerical simulations. They find that the effect stemming from the internalization of the innovation externality dominates, leading to a reduction in the innovation incentives of the merging firms. Turning to industry-level investments, they find that, while the merged entity reduces its R&D effort, non-merging parties respond by raising theirs. To determine the net effect, the authors rely on numerical simulations and conclude that, in their baseline model without synergies or spillovers, the merger reduces overall R&D investments.

In an extension, the authors consider two types of R&D efficiencies that may result from

that a merger leads to more investment in the model à la Singh and Vives (1984) employed by Mukherjee (2022). Valletti (2025) makes a similar observation.

the merger: (i) synergies that improve the effectiveness of innovation and (ii) reductions in R&D costs.[8] Using the same simulation-based approach as in the baseline analysis, the authors show that, in both cases, the negative impact of the merger on innovation can be overturned if R&D efficiencies are sufficiently large.[9]

Bourreau and Jullien (2018) study the effect of a merger to monopoly in a market where two firms compete in both price and coverage with a new technology (e.g., the telecom market). The authors show that in a duopoly equilibrium, one of the two firms covers more locations than the other if their products are sufficiently differentiated and firms cannot price discriminate between locations where they face competition and those where they do not. In this equilibrium, the firm serving both the duopolistic and monopolistic segments sets a price between the multi-product duopoly equilibrium price and the single-product monopoly price, as it balances the incentive to raise the price in the monopolistic segment against the incentive to lower it to attract consumers in the duopolistic segment. The rival is more aggressive but, because prices are strategic complements, its equilibrium price is higher than the multi-product duopoly equilibrium price.

If the firms merge, the merged entity coordinates the deployment of the two products. The authors find that a merger raises prices (to the single-product monopoly level), increases total coverage, and results in fewer locations being served by both firms, thereby reducing variety for some consumers. By raising equilibrium margins, a merger also increases the merging firms' incentives to invest in coverage.[10] The authors find that the impact of the merger on consumer surplus and total welfare can be either positive or negative depending on the parameters of the model.

2.1.4 General approaches

We now discuss two papers that examine the effects of mergers on innovation within general frameworks that allow for both cost-reducing and quality-enhancing investments.

Bourreau et al. (2024) investigate the effects of a horizontal merger in a setting where (incremental) innovation can be cost-reducing and/or quality-enhancing, and demand functions take a general form. In their baseline model, they study the impact of a merger between two symmetric duopolists on their incentives to innovate, assuming away any spillovers or synergies in either R&D or production. They show that the overall impact of the merger on innovation is the sum of a *market power effect* and an *externality effect*.

[8] Synergies that improve the effectiveness of innovation include, for instance, bringing together complementary R&D assets and enabling voluntary knowledge spillovers. The authors do not consider involuntary spillovers in their analysis, although they acknowledge that the internalization of such spillovers by the merged entity could lead to an increase in its investment.

[9] For consumer surplus to increase, R&D efficiencies must be even larger to offset the negative impact of the merger-induced price increase.

[10] This effect is referred to as the *demand expansion effect* in Jullien and Lefouili (2018) and Bourreau et al. (2024).

The former subsumes two effects driven by the impact of the merger on output. First, when innovation increases margins, a reduction in output has an adverse effect on merging firms' incentives to innovate. This *margin expansion effect* is negative. Second, a change in output may affect the return to investment per unit of output, either positively or negatively. The *externality effect* can also be decomposed into two effects. First, the merged entity accounts for the negative impact of each merging firm's innovation on the other merging firm's demand, which reduces its incentives to innovate (the authors call this the *innovation diversion effect*). Second, the merger has an impact on the merging firms' margins and thereby affects their incentives to innovate when innovation increases their sales. This *demand expansion effect* is positive.[11] An important insight of the paper is that, whenever the externality effect is different from zero, it is negative if and only if the price diversion ratio,[12] which measures the reallocation of output between the merging parties as a consequence of a unilateral increase in the price of one of the two parties, is less than the innovation diversion ratio, its counterpart for innovation.[13]

The authors show that when innovation reduces marginal costs but does not affect demand, the externality effect is zero and the market power effect is negative. Therefore, a merger reduces innovation in this case. By contrast, when innovation affects demand, the externality effect generally differs from zero, and the impact of the merger on innovation can be either positive or negative. This in turn implies that the effect of the merger on consumer surplus is ambiguous in general. However, simulations relying on two classes of demand functions under which a merger can spur innovation suggest that it is unlikely that a merger benefits consumers in the absence of both synergies (in R&D and production) and spillovers.

The authors pay special attention to the case in which mergers are *P-neutral*, meaning that they would not lead to changes in prices if the innovation levels of the merging parties were fixed.[14] This allows investigating a *standalone* innovation theory of harm, that is, a theory of harm in which adverse effects on innovation are not (entirely) driven by adverse effects on prices.[15] It is shown that in the case of P-neutral mergers, the overall impact of the merger on innovation depends solely on the comparison of the price diversion ratio and the innovation diversion ratio. If the former (resp., latter) is greater, a merger raises (resp., reduces) the merging firms' incentives to innovate.

[11] The combination of the *market power effect* and the *demand expansion effect* are the counterpart to the *price coordination channel* in Federico et al. (2018), while the *innovation diversion effect* corresponds to the *innovation externality channel* in that paper.

[12] The price diversion ratio is commonly used by competition authorities, in particular in the Upward Pricing Pressure (UPP) analysis initially proposed by (Farrell and Shapiro, 2010).

[13] The innovation diversion measures the reallocation of output between the merging parties as a consequence of a unilateral increase in the quality of one of the two parties. For a discussion, see Salinger (2019).

[14] Note that efficiency gains in production are necessary for this to happen.

[15] See Denicolò and Polo (2019) for a critical assessment of the innovation theory of harm.

Finally, the authors allow for R&D synergies and spillovers and show that their decomposition admits a straightforward extension under these conditions. Moreover, they find that the comparison between the innovation and price diversion ratios remains informative, provided the diversion measures are appropriately adjusted to reflect the presence of spillovers or synergies.

Moraga-González and Motchenkova (2026) consider a more general model in which (i) R&D investments may affect both the probability of innovation success and the payoff conditional on success, and (ii) competition is captured in a general reduced-form way. Their unified framework nests the findings of many models in the literature (e.g., Federico et al. 2017; Denicolò and Polo 2018; Motta and Tarantino 2021; Bourreau et al. 2024; D'Annunzio et al. 2025). Moreover, it shows that relaxing two restrictive assumptions commonly used in the literature[16] yields a novel insight: in some cases, the pre-merger level of investment—and, hence the shape of the R&D cost function—plays a key role in determining whether a merger reduces or raises investment incentives.

The authors identify three channels through which a merger (to monopoly) affects merging firms' incentives to invest in R&D: the anticipation of post-merger price coordination, the internalization of a negative innovation externality due to the effect of a higher probability of success on the rival's payoff, and the internalization of a negative externality resulting from the introduction of superior products or the production of goods at lower marginal costs.[17] They also show that the sign of the effect of a merger on investment incentives hinges on the comparison of the pre-merger Arrow replacement effect with its post-merger counterpart net of the externality on the merging partner, in both cases where the partner's innovation effort succeeds and where it fails.

The authors first examine the class of models in which R&D investments affect only the probability of innovation success. They show that four possible outcomes can arise, depending on how the pre-merger Arrow replacement effect compares with its adjusted post-merger counterpart, in both scenarios where the partner succeeds and where it fails. If the pre-merger effect is smaller (resp., larger) than its adjusted post-merger counterpart in both scenarios, the merger reduces (resp., increases) innovation. When the comparison yields different outcomes across scenarios, the impact of the merger on innovation depends on the pre-merger level of investment and, consequently, on the marginal cost of R&D. Similar results are shown to hold for models in which R&D affects payoffs conditional on innovation success without affecting the probability of success. In this class of models,

[16]The first restriction is that several models in which R&D increases the probability of success, without affecting payoffs conditional on success, assume that firms earn positive profits only if they succeed in innovation (Federico et al. 2017; Denicolò and Polo 2018; D'Annunzio et al. 2025). The second is that, in models in which R&D investment affects payoffs conditional on innovation success, the (exogenous) probability of success is typically set to one (Motta and Tarantino 2021; Bourreau et al. 2024).

[17]The combination of the second and third channels is a generalization of the *innovation externality channel* identified in Federico et al. (2018).

the authors also show that the probability of innovation success plays a crucial role in determining the effect of a merger on innovation incentives.[18] For both classes of models, the authors provide micro-founded examples illustrating each possible outcome.

The authors also study the impact of R&D synergies, considering both R&D output synergies that arise when innovations developed by one division of the merged entity can be used by the other division, and R&D input synergies, modeled as R&D spillovers across the divisions of the merged entity allowing the "effective" R&D effort of a division to increase with the effort of the other division. They find that R&D output synergies sometimes—but not always—increase the merged entity's R&D efforts, whereas R&D input synergies always enhance such efforts.[19] Finally, the authors analyze the effect of a merger on consumer surplus. They show that when a merger reduces R&D investments, it always reduces consumer surplus. However, when it leads to more R&D investments, its effect on consumer surplus becomes *a priori* ambiguous. The authors consider several micro-founded examples and find that, in single-product settings without synergies, these examples provide little support for a positive effect of mergers on consumer surplus, even when the merger leads to more innovation.[20] By contrast, they show that a merger can increase consumer surplus in settings with synergies or in multi-product environments with limited overlap between the merging firms' products.[21]

2.1.5 Dynamic aspects

In this section, we review two papers that investigate the effects of horizontal mergers on innovation investment in a dynamic setting.[22]

Das et al. (2025) consider a dynamic setting with uncertainty about the feasibility of innovation. In their model, two competitors have the opportunity to develop innovations by making investments along a research avenue. The research avenue can be either *good* or *bad*; a good research avenue rewards R&D effort with a product innovation according to a Poisson process, while a bad research avenue never generates innovation. Initially, firms are unaware of the avenue type, but they learn about it over time through observable

[18] In particular, they illustrate this in a Singh and Vives (1984) model with cost-reducing innovation. When the probability of success is high—as in Motta and Tarantino (2021), where it equals 1—a merger reduces innovation, whereas it increases innovation when the probability of success is low.

[19] Denicolò and Polo (2021) also investigate the effects of innovation sharing between merging firms and show that it can make horizontal mergers pro-competitive.

[20] More specifically, they consider the following examples: logit with quality-enhancing and cost-reducing innovations, Hotelling with vertically differentiated products, Sutton (2001) with quantity competition, Singh and Vives (1984) with cost-reducing innovation and Cournot competition, and Mussa and Rosen (1978) with price competition. They find that a merger to monopoly leads to lower consumer surplus in all the considered examples, except for the Hotelling example with a very steep R&D cost function.

[21] In this case, a merger can lead to higher consumer surplus, as the adverse price effects are confined to the overlapping product segment, while innovation effects extend across all products.

[22] In Section 3.1.2 we discuss other dynamic models in the context of start-up acquisitions.

research activities and innovation successes of both themselves and their rivals. In their reduced-form baseline model, the authors abstract from the standard price effects of a merger by assuming the merged entity's payoff is the sum of the independent firms' payoffs. They also suppose that there are no synergies.

The authors show that a merger affects innovation through three channels. First, there is a *cannibalization effect*: the second (follow-up) innovation partly displaces the gains from the first (game-changer) innovation due to substitutability between them.[23] The merged entity internalizes this negative externality and, as a result, may choose to block a follow-up innovation once the first has been achieved. Second, there is an *appropriability effect*, which relates to the extent a firm can capture the returns from its innovation efforts. A firm's incentive to innovate is negatively affected by the possibility that its rival introduces a follow-up innovation. A merger allows the merged entity to have control over (and reap benefits from) such a follow-up innovation, which increases incentives to invest in the first innovation.[24] Third, there is an *informational effect*: a successful innovation by one firm reveals information about the quality of the research avenue, creating an informational spillover that reduces incentives to invest due to free-riding. The merged entity internalizes this spillover and thus intensifies its research efforts, accelerating the timing of the first innovation. The first effect is negative, whereas the second and third are positive. Note that the third effect is novel, arising from the dynamic nature of the model, while the first two are dynamic counterparts of effects previously examined in static settings.

The authors show that when the cost of research is low enough, a merger always has a positive effect on innovation because the merged entity never blocks the second innovation, and invests more in the first, thereby accelerating its arrival. However, if the cost of research is neither too low nor too high, the merged entity discontinues research on the second innovation because it is unprofitable, but invests more resources in the first. In this case, the overall impact of the merger on innovation is ambiguous. Finally, if the cost of research is high, the merger has no impact on innovation because neither independent firms nor the merged entity have an incentive to invest in a second innovation. Therefore, all externalities become irrelevant.

Next, the authors examine how the effect of a merger depends on the prior belief that the research avenue is good. They show that the merger is less desirable when firms are more optimistic about the prospect of the first innovation. This implies that competition authorities should be less lenient toward mergers when there is less uncertainty about

[23] This dynamic externality resembles both the static *innovation externality* in Federico et al. (2018) and the static externality underlying the *innovation diversion effect* in Bourreau et al. (2024).

[24] Notably, in this paper, the merger-induced increase in appropriability is not driven by the increase in market power resulting from the merger. This contrasts with Federico et al. (2018), where the increase in appropriability arises through the *price coordination channel*.

the feasibility of innovation. The authors derive another policy insight by investigating the impact of innovation substitutability. Specifically, they establish the counterintuitive result that the benefit of the merger may be greater when the first and second innovations are closer substitutes.

Finally, the authors extend their model to incorporate the (standard) price effects of a merger. They find that while the market power effect of a merger has an adverse impact on consumer surplus, it also raises innovation incentives by strengthening the appropriability effect and weakening the cannibalization effect. As a result, even in the presence of price effects, a merger can still lead to an increase in consumer surplus.

Marshall and Parra (2023) adopt a dynamic "creative destruction" approach to study the effects of mergers on market structure, expected time between innovations, industry-wide R&D expenditures, and social welfare. In their setting, at any given moment, there is a technology leader earning monopoly profits and followers making no profit. Innovation dynamics generate entry and exit of firms, and this relates to the value of being a leader. When the value of being a leader is very high, many entrants are attracted to the market, which increases the speed of innovation and, therefore, makes the lifespan of the leader shorter. On the contrary, when the value of being a leader is very low, there is little entry, which decreases the speed of innovation and increases the lifespan of a leader.

The authors compare innovation outcomes in the case in which all firms compete and in the case in which there is an unexpected merger that entails R&D synergies, i.e., the merged entity is more effective than the other firms in reaching a breakthrough. This induces more market concentration and exit by some firms. If the merger entails only small efficiency gains, then it has no effect on the speed of innovation but, since there is exit of some followers, the overall R&D expenditures decrease. However, when the efficiency gains are large enough, the merged entity can achieve an innovation pace that is higher than the pre-merger one. In turn, the merger reduces the waiting time between innovations and induces all inefficient followers to leave the market.

The authors conclude that mergers with R&D efficiencies are welfare-improving whenever entry into the market is costly and timely. The reason is that in this case mergers that entail R&D synergies either increase the pace of innovation or keep it constant while reducing overall R&D expenditures.

2.1.6 Diversity and direction of innovation

Mergers can affect not only the amount of R&D investments, but also the diversity of R&D projects and the direction of innovation.[25] Letina (2016), Gilbert (2019) and Moraga-

[25]This issue has emerged, for example, as one of the main reasons why the Department of Justice, supported by the Department of Defense, opposed the proposed merger between Lockheed Martin and Northrop Grumman in 1998 (Letina, 2016).

González et al. (2022) study the effects of horizontal mergers in settings where firms can invest in more than one R&D project. The first two papers find that a merger tends to induce a lower variety of developed projects, while the third shows that a merger distorts R&D portfolios in a way that can have either positive or negative effects on consumers.

Specifically, Letina (2016) studies the effect of horizontal mergers on R&D portfolios starting from the following trade-off: on the one hand, higher variety of R&D projects increases the probability that the innovation is discovered; on the other hand, more duplication of R&D projects leads to stronger product competition ex post. In his baseline model, the author assumes competition between symmetric firms that choose the subset of research projects to invest in. Innovation is stochastic and drastic, with all projects being ex ante symmetric in the probability to succeed, but with different fixed development costs. When choosing the projects to develop, firms face a trade-off because cheap projects have the same probability of success as costlier ones but attract more competitors. The author identifies the equilibrium R&D portfolio and finds that R&D variety is lower if a merger occurs. To escape competition, a firm can invest in projects that are more expensive, leading to more diversity. As a merger reduces competition, all else equal, it also leads to less variety of funded projects.

Gilbert (2019) extends the framework of Federico et al. (2017) by assuming that firms decide how many R&D projects to undertake.[26] The author shows that the presence of technological spillovers plays a critical role in understanding the overall impact of mergers on the level of investments in R&D and the probability of discovery. First, he shows that absent technological spillovers, the effect of mergers on investments can be either positive or negative, but the overall effect on consumer surplus is negative, as losses from increases in prices outweigh any gain in innovation incentives. Second, if technological spillovers are present and benefit imitators or enable follow-on innovations, then mergers may not only spur more investments in the industry but also have a positive effect on consumers.

Moraga-González et al. (2022) investigate the impact of horizontal mergers on firms' innovation portfolios and consumer welfare. In an environment where firms have a fixed overall R&D budget and invest it in two research projects, the investment of a given firm in a given project has two opposite effects on rival firms. First, it has a negative effect on them because it reduces the probability that they will win the innovation contest for that project. This is the usual *business-stealing externality* .[27] Second, a firm's investment in one project has a positive effect on its rival because it increases the probability that they win the innovation contest for the alternative project. This is a novel effect, that the authors call a *business-giving externality.*[28] A merger between two firms leads to the

[26]Each firm has a fixed cost of running the project, but this cost is independent of the number of projects undertaken.

[27]This is conceptually similar to the innovation externality in Federico et al. (2018).

[28]The authors also consider an extension in which firms decide not only how to allocate their budgets

internalization of these two opposite externalities. The authors establish that when the project that is relatively more profitable is also the more (resp., less) appropriable, a merger raises (resp., reduces) consumer surplus by increasing investment in it.

2.2 Empirical evidence

Empirical evidence on the impact of mergers on firms' investments and innovation has been examined using both aggregate and sector-specific analyses. In this section, we review several such studies, distinguishing between the two approaches.

Before proceeding, we note three limitations of this empirical literature discussed by Gilbert (2022, ch. 6). First, analyses based on data from actual mergers are subject to truncation bias, since competition authorities tend to block or modify those deemed most problematic. Second, firms that choose to merge typically differ from those that do not, complicating the identification of a suitable control group. Third, these studies often face severe data constraints; in particular, few have sufficiently long time horizons to fully capture innovation effects.

2.2.1 Aggregate studies

In this section, we present three aggregate studies exploring the effects of mergers on investments.

Szücs (2014) studies the effects of mergers that were notified either to the US Federal Trade Commission or to the European Commission, over the period 1990-2009. The author addresses endogeneity and selection problems by relying on a propensity score matching technique whereby each merging firm is matched to a non-merging firm with similar characteristics that would have predicted the treatment. Using a difference-in-differences approach, the author finds that both the R&D intensity of the target firms and of acquirers drop significantly post-merger. Heterogeneous analyses of target firms show that the effect is driven by a sharper reduction in R&D intensity among small targets relative to large target firms, which also display higher pre-merger R&D effort.

Stiebale and Szücs (2022) use a dataset on 194 mergers and acquisitions cleared by European competition authorities over the period 1999-2007 with the purpose to study whether mergers can explain the higher market power in the economy. When it comes to answering this question, it is not *a priori* clear how mergers impact merging and non-merging companies. For example, an increase in mark-ups, as a measure of market power, can result from either higher prices or lower marginal costs due to merger-specific efficiencies. Which of the two explains a potential increase in markups is often impossible

across the two projects, but also the total budget they devote to the two projects. They find that a similar trade-off arises when the cost of research effort is convex.

to verify in the absence of price and cost information. Non-merging rivals, however, are unlikely to benefit from merger-specific efficiencies that their merging competitors have, and therefore an increase in mark-ups is more likely to be explained by an increase in market power. The authors find that non-merging entities increase their markup by 2-4% relative to their control group (constructed using a matching procedure) and that their investments and innovation decrease in the medium-run (that is, after 2 years from the merger approval). As they do not investigate whether mergers increase the investment and innovation activity of the merging parties, it is not clear whether these mergers had a negative or positive overall effect on investment and innovation.

Cavenaile et al. (2021) build a general equilibrium model where oligopolistic product market competition interacts with step-by-step innovation, exit and entry decisions as well as horizontal mergers. They calibrate the model with actual data from the US Department of Justice and Federal Trade Commission and conduct a counterfactual experiment where they shut down antitrust enforcement. They find a resulting welfare loss of 0.49% in consumption-equivalent terms. Moreover, they show that strengthening antitrust enforcement would generate significant welfare gains. Such a policy change would raise innovation by superstar firms but decrease R&D activity in small firms due to the negative impact on their option value derived from M&A opportunities.

2.2.2 Sector-specific studies

The relationship between mergers and investments has been studied across various sectors, revealing heterogeneity in the effects on investments. A key advantage of sector-specific studies is their ability to account for technological differences unique to each sector, which are overlooked in aggregate analyses.

Pharmaceutical sector Ornaghi (2009) studies the effects of mergers in the pharmaceutical industry on the R&D activity of consolidated firms. He focuses on mergers between the largest drug makers over the period 1998-2004, and finds that, merged firms have, on average, lower R&D expenditures, a lower number of new patents (and also new important patents) and lower R&D intensity (measured as the ratio between R&D expenditures and revenues) than a group of non-merging firms. This descriptive evidence is further corroborated by an analysis with a propensity score matching technique for which each acquirer and target is matched with a company that has similar characteristics but is not involved in a merger. The author shows that while merging and non-merging firms were following similar patterns before the merger, they differ post-merger with the merging firms reducing innovation inputs (i.e., R&D expenditures) and outputs (e.g., patents).

Haucap et al. (2019) consider 65 mergers between pharmaceutical firms that occurred between 1991 and 2007 and went under scrutiny by the European Commission, and find

that, overall, mergers led to less innovation by merging parties relative to non-merging firms.[29] Employing a difference-in-differences approach to estimate the average effect of the merger on patent applications by the merging parties, they find that horizontal mergers have, on average, a negative effect on innovative activities three years from the merger and an even stronger effect four years from the merger. Moreover, they show that the negative effects of mergers on innovation are concentrated in markets that, before the merger, feature high innovation intensity (measured by the average value of the patent stock by all firms active in the related product market).

Ornaghi (2009) and Haucap et al. (2019) rely on a similar method for the identification of a suitable control group (propensity score matching), focus on partially overlapping periods, and reach similar conclusions about the negative effect of mergers on innovation.

In contrast, Danzon et al. (2007) reach a different conclusion. They examine the determinants of mergers in the pharmaceutical and biotech industries and their effects on several outcomes, including R&D investment, over the period 1988-2001. A key point made by the authors is that mergers occur endogenously, and controlling for the propensity to merge is particularly important. They show that when mergers are treated as exogenous, the post-merger growth rate of R&D investment declines relative to non-merging firms. However, once they control for the propensity to merge, based on pre-merger observable characteristics, the estimated effect becomes statistically insignificant: merged firms do not differ from non-merging firms in terms of R&D investment growth. A heterogeneity analysis reveals that while small firms tend to reduce R&D investment post-merger, small firms with a high propensity to merge increase their investment substantially relative to small firms with an average propensity score.

Telecommunications sector Genakos et al. (2018) study the effects of mergers on investments using a large dataset from the telecommunications industry in OECD countries over the period 2002-2014. The authors focus on mobile network operators that obtained a license to use wireless spectrum.[30] They study the effects of market consolidation in the industry and identify a potential trade-off for consumers: mergers lead to an increase in prices, but also lead to more investments per operator, where capital expenditure (CAPEX), defined as spending by an operator on the acquisition or upgrading of fixed, physical, non-consumable assets, is used as a proxy for investment.[31] In particular, the authors find that a hypothetical average 4-to-3 symmetric merger in their data would lead to an increase in customer bills by about 16.3%, and an increase in investment

[29] The authors also develop a theoretical model that generates predictions consistent with their empirical findings. In their three-player model, two firms have relatively low innovation costs and one has higher innovation costs, and the merger involves one efficient firm and the inefficient one.

[30] They discard mobile virtual network operators, which, however, were not systematically present across OECD countries over the period of interest.

[31] The impact on total investments is, however, not conclusive.

per operator by about 19.3%. They also use their model to predict the effects of actual mergers that occurred during the considered period. For instance, according to the model predictions, the 2013 merger between Orange and 3-Hutchinson in Austria led to a price increase by 6.6% and an increase in investment per operator by 13.3%.

Lin et al. (2020) provide an empirical analysis of a hypothetical merger between T-Mobile and Sprint in the US cellphone service market where four big providers (AT&T Mobility, Verizon Wireless, T-Mobile, Sprint) operate. Specifically, they simulate the effects of a hypothetical merger in 2016 between the two providers on the deployment of 4G-LTE cellular networks by national providers using granular data at the firm-census block level. They find that relative to the baseline setting in which no merger occurs, the potential merger between T-Mobile and Sprint reduces total entry into local markets by 23%, leading to an increase in the population that is under-served. They explain this result by the fact that the merger would reduce the number of potential entrants.

Aimene et al. (2021) examine recent mergers in the European mobile market and their impact on consumer surplus when technological progress is involved. The underlying consideration made by the authors is that technical progress, in the mobile operator market, is higher with data than voice and, therefore, the impact of mergers on prices and consumer surplus can be different between data-intensive and voice-intensive markets. To test this hypothesis, the authors use data from 21 European countries, of which 5 were exposed to mergers in this sector (Austria, Germany, Ireland, Italy and Norway). Some of these mergers occurred in periods in which operators' revenues were voice-driven, whereas others occurred in periods where the revenues were data-driven. They find that mergers tend to decrease the unit prices of data and increase those of voice, and that mergers have a positive (respectively, negative) net effect in those contexts in which data usage (resp. voice usage) grows larger than voice usage (resp. data usage). For example, mergers in Austria and Germany took place when voice usage was predominant and led to a negative effect on consumer surplus. On the contrary, mergers in Ireland, Italy and Norway took place when data usage was predominant and in this case consumer surplus increased following the mergers.

Hard-disk drive sector Igami and Uetake (2020) use a structural model to estimate the effects of mergers, entry, and exit, in the hard disk drive industry during the period 1996-2016. First, they find that the relationship between competition and R&D investments is likely to be increasing, but plateaus as the number of firms grows. Specifically, the incentive to innovate increases drastically when moving from a monopolistic market structure to a duopolistic/triopolistic market. However, starting from the fourth firm, the incentive to invest becomes less sensitive to the increase in the number of firms. The authors also simulate the effects of merger enforcement. Their empirical findings support a

rule of thumb according to which mergers should be blocked when three or fewer firms exist, which they view as a reasonable approximation of the US Federal Trade Commission's decision-making practice.

Bennato et al. (2021) use a structural model to identify the effects of two mergers—leading to a 5-to-3 consolidation—that occurred in 2012 in the hard disk drive industry and their impact on product innovation. The authors rely on a matrix completion method to derive suitable counterfactuals for their analysis and consider as controls firms operating in the flash memory technology market. They identify three main effects. First, R&D investment increased. Second, the number of patents declined, which may be explained by a reduction in duplication and defensive patenting. Third, patent citation intensity increased.

Other sectors Valentini (2012) focuses on the US medical devices and photographic equipment industries, over the period 1988-1996, and finds that mergers had a positive effect on patenting output, but decreased patent impact, originality, and generality. The author argues that one potential explanation for these findings is that mergers generate efficiencies that increase the number of patents, while also putting pressure on managers to achieve short-term results, thereby adversely affecting patent quality as measured by impact, originality, and generality.

Chen and Gayle (2019) consider the airline industry and argue that horizontal mergers can theoretically give rise to two opposite effects. On the one hand, mergers can generate efficiencies leading to higher quality, e.g., better coordination of flight schedules. On the other hand, mergers soften competition, resulting in a lower incentive to invest in product quality, as consumers now face fewer alternatives to consider. The net effect depends on the relative magnitude of these two forces. They show that if pre-merger competition is weak (i.e., there is little substitutability), post-merger product quality increases, as in this case the coordination benefit resulting from the merger is strong. However, if pre-merger competition is intense (i.e., there is strong substitutability), post-merger product quality decreases, as in this case the coordination benefit stemming from the merger is limited.

These predictions are tested by leveraging the fact that the intensity of competition between airlines is route-dependent, as operators serve multiple markets. The authors study the effects of two major mergers—the Delta/Northwest merger in 2008 and the Continental/United merger in 2010—on product quality, which is measured by the percentage ratio of nonstop flight distance to the product's itinerary flight distance used to get passengers from the origin to the destination.[32] Using data covering the time span 2005-2013 (before and after the merger), they find that the two mergers were associated with an increase in routing quality when the airlines were not competing before the merger, but with a

[32]For example, the routing quality of a direct flight has a maximum value of 100.

decline in routing quality in the presence of pre-merger competition.

Igami et al. (2025) study the relationship between competition and innovation in the liquid crystal display (LCD) industry over the period 2001-2011. They use a structural model to identify the welfare effects of both process and product innovation in this industry. They find that without product innovation, overall welfare would have been 71% lower, whereas without process innovation, overall welfare would have been 35% lower. They also find heterogeneous effects, with process innovation having stronger effect in the mature notebook and monitor segments, whereas product innovation, particularly the introduction of larger products, had a stronger impact in the nascent LCD TV segment.

Moreover, the authors simulate the impact of various mergers on total welfare and innovation (measured by the industry-wide sum of private gains from investments), absent merger-specific efficiencies. Specifically, they simulate a total of 4,803 potential mergers, covering all seven-to-six, six-to-five, five-to-four, four-to-three, three-to-two and two-to-one mergers. They find that the impact of mergers on innovation is heterogeneous. Among mergers in the range from seven-to-six to three-to-two, about one third lead to higher investment incentives, while the remaining mergers reduce them. Two-to-one mergers are, however, very different, with about 95% of such mergers increasing incentives to invest. The authors also find that the mergers they simulate almost always have a negative effect on total welfare.

3 Acquisitions of innovative entrants

Startups play a critical role in the generation of new ideas and products. A key aspect of the current debate on mergers and investments is whether large incumbents should be allowed to acquire startups.[33] In this section, we discuss recent papers that study how acquisitions of potential competitors by incumbent firms can affect the incentives to invest of the acquiring party and/or the acquired party.[34]

3.1 Theory

Merger policy may affect firms' decisions to enter a given market. In particular, a more lenient merger policy can make entry more attractive by increasing the probability that the entrant gets acquired by an incumbent. This strategy is known as *entry for buyout* (Rasmusen, 1988) or *innovation for buyout* (Cabral, 2018).[35]

[33] See Teh and Wang (2025) for a survey focusing on startup acquisitions and innovation.

[34] A more recent literature has emerged to analyze the effects of *acquihiring*, that is a firm's acquisitions of startup talent (Benkert et al., 2025; Bar-Isaac et al., 2025). A review of these studies is beyond the scope of this paper.

[35] Recent empirical evidence suggests that acquisitions have now surpassed IPOs as the primary exit strategy for young firms (Ederer and Pellegrino, 2023; Alezra and Berquier, 2024).

In what follows, we first examine the effects of acquisitions of innovative entrants in settings with single innovations in isolation. We then review the literature that considers models with sequences of innovations. Finally, we discuss how acquisitions of innovative entrants affect diversity and direction of innovation.

3.1.1 Models with isolated innovations

In this subsection, we examine the impact of start-up acquisitions on investments in models that consider single innovations in isolation.

Norbäck and Persson (2012) study the effects of merger policy on an entrepreneur's incentive to innovate in a setting where the entrepreneur can either enter a market with multiple active firms and commercialize the innovation herself (entry scenario), or sell the innovation to one of the incumbents (buyout scenario). They first examine how competition intensity affects the entrepreneur's incentive to innovate. In the entry scenario, greater competition unambiguously reduces this incentive. In the buyout scenario, however, the effect is ambiguous: more competition reduces an incumbent's profit both when acquiring the innovation and when not acquiring it. As a result, the impact of competition on the incumbent's willingness to pay—and thus on the entrepreneur's incentive to innovate—is ambiguous.

The authors then examine how a merger policy that commits to maintaining a minimum number of firms in the market affects the entrepreneur's incentive to innovate. They show that the incentive for innovation for buyout relative to innovation for entry increases under a stricter merger policy due to the mechanism discussed above. Moreover, they show that the effect of a stricter merger policy on the incentive to innovate for buyout is inverted U-shaped: in markets with low concentration, stricter merger policy increases innovation incentives, whereas in highly concentrated markets it reduces them.

Mason and Weeds (2013) argue that four main effects should be considered when designing an optimal merger policy that accounts for the incentives of firms to enter a market. First, there is an *entry encouragement effect* as a more lenient merger policy creates more incentive for entrants to enter the market. This effect is positive, as it leads to an increase in social surplus (irrespective of whether the merger actually occurs). Second, there is a *competition effect* as the merger reduces the social surplus when it takes place relative to the case in which the entrant and the incumbent compete. Third, the latter adverse effect can be reduced if there are *merger-specific synergies*. Finally, there is a *sunk cost effect*, as more entry generates higher expected sunk costs. The authors show that the optimal merger policy amounts to choosing a threshold for the entrant's profit below which a merger is allowed and above which it is blocked. Therefore, their approach provides a theoretical foundation for the failing (or "ailing") firm defense story.

This analysis is extended by Jaunaux et al. (2017) who show that a competition au-

thority may find it optimal to be more lenient toward the acquisition of successful, rather than unsuccessful, entrants. They consider a setting in which an entrant decides whether to enter a market with uncertain post-entry profits, observing in advance the behavior of an antitrust authority that can commit ex ante to its policy toward merger proposals. The authors show that the competition authority should be most lenient in the state of the world where the ratio between the loss in ex post consumer surplus and the gain in the entrant's expected profit induced by the merger is the lowest. Applying this general rule to a setting where uncertainty is about the entrant's marginal cost of production, they find that, depending on circumstances, competition authority should be more lenient toward the acquisition of unsuccessful entrants or toward those of successful entrants.

Cunningham et al. (2021) investigate the concern that incumbents' acquisitions of innovative entrants might be motivated by their incentives to preempt future competition. They build a model in which several incumbents compete in a market by offering differentiated products and a startup has an innovative project. If an incumbent chooses to acquire the start-up, it must decide whether to pursue or abandon its project. The authors call the latter case a "killer acquisition". They find that an acquiring incumbent may have incentives to pursue a killer acquisition when the startup's project overlaps with its own products or projects. They also show that both existing and potential competition reduce these incentives. Finally, they establish that killer acquisitions can occur even when the startup's project is superior to the incumbents' products or projects and when incumbents enjoy an advantage over the start-up in terms of development synergies.[36]

Some startups may not be actual or potential competitors of incumbents but could still affect competition in the market by representing inputs that allow an incumbent to get a competitive advantage over other incumbents. Bryan and Hovenkamp (2020) consider a model in which an incumbent competes with a less efficient rival. In the market, a new startup is present and provides a promising input technology. The authors identify the inefficiencies that can arise with respect to the diffusion, diversity, and rate of innovation under *laissez-faire*. For instance, the incumbent may have the incentive to buy the startup even if the latter would not directly benefit the incumbent in terms of higher quality. The reason is that an acquisition by the rival could reduce (vertical) product differentiation and therefore make competition more intense.

Motivated by the acquisitions made by Big Tech companies over the last few years, Motta and Peitz (2021) examine the effects of merger policy on innovation incentives in a setting where an incumbent can acquire an innovative entrant (e.g., a startup). In their model, the entrant has a project (e.g., prototype, blueprint, innovative idea) that requires fixed development costs and additional resources (e.g., data, expertise) and has an uncertain outcome. Before a project is developed, the incumbent may acquire

[36]The empirical part of Cunningham et al. (2021) is discussed in Section 3.2.2.

the startup and then decide whether to proceed with development. Depending on the fixed development cost and the probability that the innovative idea is successful, different outcomes emerge.

Specifically, the authors distinguish two scenarios depending on whether the startup could develop its project in the absence of an acquisition. If the startup lacks the necessary resources, the incumbent's post-acquisition decision depends on the expected profitability of the project net of the fixed development cost. If the development cost is low, an *efficient upgrade* occurs: an innovative product that would not otherwise have been developed is brought to the market. If the development cost is high, the acquisition results in a *dead project*, with only the incumbent being active in the market.

If the startup has the resources to develop its project, two additional equilibria can arise. If the development cost is low relative to the expected net profitability of the project, the incumbent finds it optimal to develop the project, which results in an *upgrade with suppressed competition*: the startup's innovative product is developed but competition is eliminated. If the development cost is high, instead, the incumbent does not develop a project that would have been pursued by the entrant, resulting in a *killer acquisition*.

In a related setting, Fumagalli et al. (2024) focus on the interplay between acquisitions and the behavior of competition authorities. In their model, a startup has a project that, if developed, allows it to compete against an incumbent. The startup may be either *viable* (i.e., it has the resources to develop the product in the absence of an acquisition) or *unviable* (i.e., it cannot develop the project on its own). As in Motta and Peitz (2021), the key trade-off is the following. On the one hand, the acquirer may decide to shelve a project that would have been developed by the startup absent an acquisition. On the other hand, the acquisition may allow the development of a project that would otherwise not be developed due to a lack of resources. A major contribution of this paper is to show that the price paid for an acquisition generates relevant information regarding the anti-competitive potential of such an acquisition. Specifically, the authors show that a competition authority who does not know the type of the startup but observes a low takeover price, learns that the startup is unviable, which implies that its acquisition has a (weakly) positive effect on welfare. However, if the competition authority observes a high price, it does not learn the type of the startup. Despite this, it turns out that the optimal merger policy is to prevent high-price acquisitions (and clear low-price ones). Under such a policy, an incumbent only faces two options: offer a low price (and develop the project) or make no offer. This implies that the merger policy generates a "selection effect" as it encourages acquisitions focusing on unviable startups. This explains why this policy is optimal even though it prohibits high-price takeovers that may be welfare-beneficial.

In the context of digital platforms, Kamepalli et al. (2020) examine how acquisitions of entrant firms by an incumbent platform affect innovation and entry in industries charac-

terized by strong network externalities and switching costs for some customers. They find that the prospect of being acquired can discourage entry and innovation by potential entrants. This contrasts with the standard economic view that acquisitions stimulate entry by providing exit opportunities, and is explained by the role of network effects. In such markets, early adopters (e.g., app developers) are crucial in driving adoption by ordinary users of a new platform. However, if these early adopters anticipate that the entrant will soon be acquired, they have less incentive to adapt to the new platform, knowing that the incumbent will integrate the superior technology after acquisition. This weaker early adoption, in turn, reduces the incentives for new platforms to enter and innovate.[37]

Bisceglia et al. (2024) examine the interaction between exit policy and entrants' investment decisions. They consider a market in which an incumbent, having committed to invest, competes in quantities with an entrant that holds an exit option. In their model, the entrant must decide whether to invest before learning the realized demand. Once demand is observed, the entrant can either exit the market or compete with the incumbent. One possible exit strategy, on which we focus here, is acquisition by the incumbent.

The authors use this framework to study the effect of merger policy on entrant investment. The competition authority faces a trade-off between strengthening competition in the product market and encouraging investment. The *innovation-for-buyout effect* arises even though the incumbent holds all the bargaining power and faces no competition at the acquisition stage. This occurs because, in the considered asymmetric information setting, a higher exit value for the entrant selects more efficient entrants, which in turn makes the incumbent relatively less aggressive, ultimately benefiting the entrant.

In equilibrium, all mergers are killer acquisitions, yet a lenient merger policy can maximize consumer surplus in industries with high investment costs, as it induces investments that would not occur under stricter enforcement. In such cases, even if the entrant may be acquired by the incumbent, it is less likely to exit under a lenient policy because investment yields higher-quality products.

3.1.2 Models with multiple innovations

A recent strand of the literature examines acquisitions of startups in dynamic settings with multiple innovations. The dynamic nature of these models enables, for instance, an analysis of how repeated acquisitions feed back into the evolution of market dominance and, in turn, affect innovation.

It is useful to begin by describing the seminal paper by Segal and Whinston (2007), as several subsequent studies build on it to analyze the effects of start-up acquisitions

[37] Using data from Pitchbook, the authors provide empirical evidence that venture capital investment and startup activity decline significantly in sectors following major acquisitions by Facebook and Google, consistent with the existence of a "kill zone" effect.

on innovation.[38] Segal and Whinston (2007) develop a discrete-time, infinite-horizon model in which two firms invest in R&D, with one firm acting as the incumbent and the other as the potential entrant in each period. Innovation is incremental, and if a potential entrant innovates, it competes with the current incumbent before becoming the new incumbent. An antitrust policy that restricts an incumbent's behavior toward an entrant increases the expected profit of a potential challenger, thereby encouraging greater R&D investment. However, such a restrictive policy may also reduce the profit of the current incumbent. As successful entrants become incumbents, both effects matter for the incentive to innovate. A core insight of the paper is that in many circumstances involving R&D-deterring conduct, the apparent conflict between the effects on entrant and incumbent profits does not arise. In such cases, a more restrictive antitrust policy increases the profits of both of them and, therefore, leads to a higher rate of innovation.

Building on Segal and Whinston (2007), Cabral (2018) develops a dynamic innovation model with a dominant firm and a fringe firm to study the effect of technology transfers (for instance through acquisitions) on innovation. In each period, firms earn profits that depend on the current technology state and choose their innovation rate. A successful incremental innovation changes the state, which can be either: (i) the dominant firm is the technology leader and the fringe firm the laggard, or (ii) the reverse. The author shows that, in the absence of technology transfers, greater firm dominance reduces the average innovation rate. The reason behind this is the following. As the dominant firm becomes more dominant, its incentive to innovate rises, while the fringe firm's incentive to innovate decreases. Although the encouragement effect outweighs the discouragement effect in absolute terms, the fringe firm is the laggard more frequently in the steady state. Consequently, greater dominance reduces the average innovation rate. The dynamic nature of the model is key to this finding: a static model would yield the opposite result, as it would only compare the magnitudes of the encouragement and discouragement effects.

Then, the author establishes that allowing for technology transfers increases innovation. This is driven by the *innovation-for-buyout effect*: a fringe firm that innovates can earn higher profits by transferring its innovation to the dominant firm, as the latter is assumed to obtain higher profits from any given technology.[39] Finally, the author extends the model to allow for radical innovation, which creates a new dominant firm. He finds that, unlike in the case of incremental innovation, technology transfer reduces radical innovation. The policy implication is that, when assessing the desirability of technology transfers, it is important to distinguish between radical and incremental innovations—that is, between competition *for* the market and competition *in* the market.

Hollenbeck (2020) analyzes industry dynamics allowing for mergers and quality invest-

[38] Segal and Whinston (2007) do not consider acquisitions.
[39] This requires that the dominant firm does not hold all the bargaining power.

ment, and identifies conditions under which mergers that reduce consumer surplus in the short run (due to higher prices) generate a positive long-run effect on innovation. The author finds that this is possible if entry costs are relatively low and both new entrants and dominant firms are capable of generating rapid innovations. He shows that when there are mergers, more firms enter the market, and these entrants invest in new products. The introduction of new products intensifies competition, which in turn fosters further investment and may generate long-term benefits for consumers. The author also finds that if acquisitions lead to the incorporation of innovation in existing products, then the positive effect of mergers is amplified because synergies arise.

Katz (2021) adds to the literature by studying merger policy in a context in which competition is for (rather than in) the market and an incumbent can acquire a potential competitor. He considers a dynamic game where in each period an incumbent decides whether to remain active in the market, and a potential entrant, which arrives with an exogenous probability, can invest in a new technology. After entry occurs, the incumbent can decide whether to merge with the entrant or compete with it. If competition takes place, in the following period one of the firms exits the market (because there is competition for the market). The author shows that mergers always occur if not prohibited and that two cases can arise. In the first case, the merged entity only uses the new technology (of the entrant) and shuts down the old one; in the second case, the merged entity only uses the old technology and shuts down the new technology (of the entrant). In the latter scenario, there is an effect similar to that of a killer acquisition as the new technology is dismissed immediately after acquisition. However, this is not necessarily inefficient. The reason is that absent a merger, the market moves to the new network and technology, whereas with the merger, consumers stick with the old technology (under some conditions), which may be socially efficient because of network effects.

Mermelstein et al. (2020) study merger policy in a dynamic setting where an antitrust authority has the power to block proposed mergers. In each period, firms bargain over potential mergers; if a merger is proposed, the authority decides whether to approve it, and new entrants may enter the market. Firms then compete in quantities and make capital investment decisions. Given the dynamic nature of the model, the authors focus on the steady states that emerge under different merger policies. In the steady state where all mergers are allowed, the average level of capital investment is lower than in the case where all mergers are prohibited. This is because merger approvals tend to result in monopolized or near-monopolized markets, reducing firms' incentives to invest. The model also yields results consistent with the logic of entry for buyout, as in Rasmusen (1988): investment by small firms increases when a dominant firm is present. However, such investment is inefficient, as it is often high-cost and crowds out more efficient investment by incumbents.

The authors then endogenize merger policy by considering the optimal decisions of

a social planner or competition authority. The main result depends on the objective function: if the planner maximizes consumer surplus, the optimal policy is to block all mergers. If instead the goal is to maximize aggregate surplus, some mergers may be approved. However, even under this objective, only a limited number of mergers are allowed, due to the inefficiencies associated with the entry-for-buyout effect.

The long- and short-run effects of acquisitions are also studied by Denicolò and Polo (2025) in a Schumpeterian model of repeated innovation and acquisition. In the short run, acquisitions are pro-competitive because the prospect of being acquired increases the entrants' incentives to innovate (the *invention-for-buyout effect*). However, in the long run, acquisitions are anti-competitive because they increase the incumbent's market dominance (the *entrenchment-of-monopoly effect*). The latter effect arises when an acquisition strengthens an incumbent's competitive advantage, thereby discouraging future entry and reducing potential challengers' incentives to innovate. This effect persists even when future innovators are later acquired, because increased entrenchment weakens their outside options and, in turn, the acquisition price they can obtain.

To fix ideas, the authors focus on consumer inertia—which makes demand not fully contestable—as the mechanism generating the *entrenchment-of-monopoly effect*, although other mechanisms, such as data access advantages and dynamic economies of scale, can also give rise to it. This effect cannot arise in a static setting with an isolated innovation, underscoring the relevance of a dynamic framework. Importantly, it can outweigh the invention-for-buyout effect, thereby reversing the result that would be obtained in a static version of the model.

In light of their findings, the authors argue that acquisitions should be assessed considering their cumulative effects, taking into account the degree of market dominance. In particular, they show that it may be optimal to have a merger policy that is lenient as long as market dominance is low but becomes restrictive if repeated acquisitions makes the dominance of a given incumbent too strong.

3.1.3 Diversity and direction of innovation

The prospect of an acquisition can affect not only the level of innovation but also its direction, an aspect studied by Gilbert and Katz (2022), Letina et al. (2024), Dijk et al. (2024) and Dijk et al. (2025).

Gilbert and Katz (2022) develop a model to study how a merger affects the ex-ante investment incentives of an entrant that can either imitate the incumbent's existing product or sell a horizontally differentiated product. If the entrant does not anticipate an acquisition, there are parameter values under which it chooses to horizontally differentiate from the incumbent to soften competition. However, if it has a sufficiently large quality advantage, it chooses to minimize horizontal differentiation.

The authors show that the prospect of a merger can affect the direction of the entrant's investment in two ways. First, it may encourage the entrant to increase horizontal differentiation from the incumbent, thereby enabling the merged firm to offer a broader product line that better matches consumer preferences while facilitating consumer segmentation and surplus extraction. Second, it may instead give the entrant incentives to reduce horizontal differentiation, thereby lowering the incumbent's disagreement payoff in merger negotiations. The authors then examine the implications of their findings for merger control and show that merger policies focused solely on a proposed merger's ex post welfare effects may induce entrants to make inefficient pre-merger investment choices.

Letina et al. (2024) consider a setting with an incumbent and an entrant and examine the effect of prohibiting acquisitions when both may innovate. The incumbent owns a technology and invests in R&D, whereas the entrant can sell an innovative product only after having invested in R&D. Ex ante there are multiple projects with heterogeneous investment costs, but ex post only one project succeeds and the corresponding innovation is patentable. In the first stage of the game, firms decide how much to invest in different research projects, and this determines the probability that (drastic or non-drastic) innovation occurs. In the second stage, the incumbent decides whether to acquire the entrant (if acquisitions are not prohibited). Finally, the firm holding the patent (if any) decides whether to commercialize the technology.

The authors identify conditions under which, absent merger control, the incumbent acquires the entrant and then decides whether to dismiss its product (resulting in a *killer acquisition*) or commercialize it (resulting in a *genuine acquisition*). Specifically, the incumbent has the incentive to acquire the entrant if the latter holds a patent for a non-drastic innovation, and commercialization depends on its value (net of its commercialization cost).

Considering the effects of an outright prohibition of startup acquisitions, the authors show that this policy has a weakly negative effect on innovation because of the lack of an exit option (i.e., the possibility of being acquired by the incumbent). Moreover, such a prohibition leads to a reduction in duplication of innovation in equilibrium. The authors also analyze two types of alternative policies: behavioral remedies restricting technology usage or prohibiting the shutdown of acquired entrants, and fiscal policies reducing the profitability of acquisitions or increasing the profitability of market entry for startups. A key appealing feature of these policies is that they prevent acquisitions only when entrants would earn relatively high stand-alone profits, indicating that they are likely to be viable competitors.

Dijk et al. (2024) consider a market in which an innovative startup has to allocate its funding across two different projects. The two projects differ in whether they are rival to the incumbent's product: one project, if successful, will represent a higher quality version

of the incumbent's product, whereas the other project is a non-rival project. The entrant finds it optimal to distort its investment decisions toward a rival or non-rival project depending on the post-acquisition rents of the incumbent. If the acquisition rents are high enough, the startup has an ex ante incentive to put more effort into the rival project and to reduce its effort on the non-rival project. If the acquisition rents are low enough, the startup has an ex ante incentive to distort its effort toward the non-rival project. The authors also investigate whether prohibiting acquisitions increases or decreases consumer surplus and show that both cases can arise.

In a related work, Dijk et al. (2025) explore the strategic interactions in R&D investment between incumbents and entrants, particularly focusing on the context of startup acquisitions. They study how startup acquisitions may affect not only the portfolio of investments of the target firm but also that of the acquirer. To this end, they consider a market in which an entrant can develop projects in two markets A and B, and the incumbent can develop a project in market A (the *rival* market) as well as a project in a third market C (the *non-rival* market). The entrant moves first, then, upon observing the outcome of the entrant's investment, the incumbent chooses its investment portfolio. If an acquisition takes place, there is a bargaining between the incumbent and the startup.

The authors highlight how the anticipation of acquisitions distorts R&D funding allocation by either increasing or reducing investment in the market where the entrant and the incumbent are potential rivals. For example, they identify conditions under which the entrant, anticipating that the incumbent will cut off R&D funding in the rival market in the prospect of an acquisition, will increase its investment in the same market and reduce investment in the non-rival market.[40] Similarly, there are cases in which the entrant, anticipating an increase in the investment by the incumbent in the rival market in the prospect of an acquisition, will strategically cut off its own investment in that market, moving resources towards the non-rival market. In turn, this change in the direction of innovation can either lead to a higher or lower consumer surplus. Interestingly, the authors compare predictions where the prospect of an acquisition by an incumbent distorts the investments of the entrant (Dijk et al., 2024) or both (Dijk et al., 2025). They show that accounting for the possibility that startup acquisitions also distort incumbents' investments may reverse the outcome of a merger review.

Teh et al. (2025) study how startup acquisitions by incumbents affect entry and innovation in markets with multiple startups. In their model, an incumbent faces potential entry from an early-stage startup (E_1) and a late-stage startup (E_2). The former is a non-target startup and follows a two-stage innovation process: first, it chooses between a disruptive project and an adventurous project; second, it decides whether to invest in developing

[40]The possibility that an incumbent reduces its own R&D investment because of the acquisition of a rival entrant has been called a "reverse killer acquisition" by Caffarra et al. (2020).

the chosen project.[41] The latter is the acquisition target and has a single project aimed at challenging the incumbent. The incumbent negotiates with E_2 after E_1 has selected its innovation direction but before either startup undertakes project development. If the acquisition occurs, the incumbent subsequently decides whether to develop the acquired project. An underlying assumption is that when both the incumbent and a startup introduce superior substitutes, competition favors the incumbent. In the baseline model, the authors show that when the cost of developing the acquired project is not too high, the acquisition can create a *kill zone* by weakening E_1's incentives to enter the incumbent's market (diverting investment towards the adventurous project) and, more generally, reducing project development in that market.[42] By contrast, when development costs are sufficiently high, the incumbent acquires the target startup only to terminate its project and soften competition, that is, a killer acquisition occurs. In this case, since the acquisition is defensive and the incumbent shelves the acquired project, there is a *safe space* for the non-target startup in which E_1 enters the incumbent's market and develops its own project.

The authors extend their setting to accommodate entry-for-buyout: in such an extension, they fix the project choice of E_1 to the disruptive project, but allow E_2 to decide which project to develop (i.e., disruptive or adventurous). They show that there exists a parameter range in which the entry-for-buyout exists, namely that E_2 changes the direction of its project anticipating acquisition and a large payout. However, the entry-for-buyout effect also affects the ex-ante incentives of E_1, which anticipating the incumbent development of the acquired project and intensified post-acquisition competition, may not develop in response in the relevant parameter range. As a result, in this setting, entry-for-buyout can lead to less innovation.

The authors also compare a *laissez-faire* regime, under which all acquisitions are approved, with a regime that bans acquisitions. From a consumer welfare perspective, this comparison reflects a trade-off between the expected (potential) gains from realizing synergies when the incumbent develops the acquired project and the expected (potential) losses arising from a lower likelihood of product development and a redirection of innovation away from the primary market. In particular, they find that, in the parameter range where the incumbent always develops the acquired project and $E1$'s innovation direction is not affected by the acquisition, the *laissez-faire* regime dominates. By contrast, in the parameter range where the incumbent always terminates the acquired project, a full ban on acquisitions dominates.

[41] A disruptive project yields a product that is a superior substitute for the incumbent's product. An adventurous project may yield either a superior substitute or an independent product.

[42] A similar *kill zone* argument is provided by Motta and Shelegia (2025). In a different setting—not involving acquisitions—they show that the threat of incumbent copying can distort entrants' ex ante incentives: anticipating imitation, entrants tilt R&D toward complementary innovations that incumbents are less likely to copy.

Callander and Matouschek (2022) examine the effects of acquisitions on the incentives to innovate in a setting where firms choose the novelty of their innovations, that is, how different they are from existing technologies. Innovation novelty is modeled as a continuum ranging from very incremental to very radical innovations. The authors show that uncertainty in the outcome of their investment induces firms to be more radical in their innovative effort. However, this comes at a cost for the firm as more radical innovations tend to be more distant from the taste of consumers. The authors investigate whether incumbents or entrants are more likely to innovate once the choice of innovation novelty is taken into account. They show that an effect that resembles the Arrow replacement effect is present because the incumbent would cannibalize existing revenues if it innovates. This gives the incumbent incentives to move away from existing products to appeal to a broader audience. Unlike the incumbent, the entrant does not suffer from the Arrow's replacement effect, which induces it to produce innovations that resemble existing products (incremental innovations).

The authors examine how the prospect of an acquisition by an incumbent affects the ex ante incentives of an innovative startup. On the one hand, the entrant may have incentives to align its innovation strategy with that of the incumbent which—absent the acquisition—would find it optimal to distance itself from the existing product (because of the Arrow replacement effect). However, by developing a product that competes more directly with the incumbent's existing product, the entrant can leverage its entry threat to extract additional surplus from the incumbent. The authors show that the latter effect dominates the former. As a result, the entrant always has an incentive to moderate the novelty of its innovation and focus on more incremental innovations.

In the context of Big Tech acquisitions, Cabral (2025) considers a market with a startup, an incumbent, and a competition agency. The author assumes that the innovation process can lead to failure, the production of a substitute product, or the production of a complement product. The startup chooses how much to innovate only knowing the probability that an innovation, if realized, can be a substitute or a complement. Then, the incumbent and the startup negotiate an acquisition, and finally the competition agency decides whether to allow the merger. The author considers several enforcement regimes. These include a balance of probabilities standard, under which a merger is blocked if it is more likely to have an anti-competitive effect than a pro-competitive effect; a balance of harm standard, under which pro- and anti-competitive effects are weighted by their impact on consumer surplus; and finally, a regime in which mergers are banned. He shows that the balance of probabilities standard is more lenient than the balance of harms standard. However, the latter is harsher than a policy that accounts for the possibility that a startup reduces its research effort in anticipation of an acquisition being blocked. The author then calibrates the model using available data from GAFAM and shows that moving from a

balance of probabilities to a balance of harms would generate welfare benefits, whereas a complete ban on mergers would result in a welfare loss.

3.2 Empirical evidence

3.2.1 Aggregate studies

Fons-Rosen et al. (2024) develop an endogenous growth model to examine the effects of startup acquisitions by incumbents. Incumbents, which produce a finite number of differentiated products, invest in innovation to boost productivity and outcompete other firms. Startups, on the contrary, focus on innovation to enter the market by displacing incumbents. The authors introduce two key elements: incumbents can invest in a search technology to acquire startups, and startup ideas require additional implementation investment to become marketable products. This framework allows for differentiation between related acquisitions (where a startup's idea is related to an incumbent's existing products) and unrelated acquisitions (where the startup's idea is unrelated to the incumbent's current offerings).

The analysis sheds light on the effects of a decrease in the frequency of startup acquisitions (because of exogenous shocks) on innovation and growth. First, such a decrease generally lowers the startup rate (i.e., the number of new startups created in a given period). Second, a decrease in startup acquisitions has *a priori* an ambiguous impact on the implementation rate of startup ideas because of two opposite effects. On the one hand, incumbents may have lower implementation costs than startups. On the other hand, an incumbent's benefit from implementing a startup idea is lower than the startup's because of the standard Arrow replacement effect. Finally, lower startup acquisitions also affects incumbents' own innovation rates through general equilibrium channels. In particular, a lower frequency of acquisitions attracts fewer startups, which reduces the threat of displacement for incumbents and increases their incentives to innovate.

The authors then construct a dataset that combines information on acquisitions, patents, and accounting data, and use it to examine the effect of acquisitions on the implementation of startup ideas. A partial equilibrium analysis shows that more frequent acquisitions increase the implementation rate of startup ideas. However, when general equilibrium feedback effects are considered, this effect is reversed; the startup rate declines significantly, with only minor compensations from increased incumbent innovation and startup implementation efforts, leading to an overall decrease in the growth rate. The authors find that a ban on startup acquisitions would increase the (aggregate) growth rate by about 0.03 percentage points per year.

Alezra and Berquier (2024) present stylized facts on innovation patterns before and after acquisitions using data from Crunchbase and patent databases, covering multiple

sectors. They find that acquired firms tend to be more innovative, young and small compared to the average. Among them, 5% are patent owners and 8.6% are patent applicants. Interestingly, 37% of transactions involving patent owners feature technological overlaps, and 64% exhibit a high degree of sector similarity.[43] As additional evidence, they find that acquired firms tend to innovate less, with 20% of acquired firms ceasing operations within one year and closure rates being higher when there is technological overlap between the acquirer and the target. Their descriptive analysis also documents a decline in patenting activity following acquisitions.

The authors further present an econometric analysis in which acquired firms (treated) are matched with similar non-acquired firms (controls). Using a difference-in-differences approach, they find that, conditional on acquisition, patent output declines by 23-27%. This decline is primarily driven by firms ceasing innovation altogether (an extensive margin effect), rather than simply innovating less (an intensive margin effect). The authors argue that this reduction may result either from the acquired firm being forced to stop innovating post-acquisition or from the firm being shut down entirely. Consistent with this interpretation, they find that acquisitions increase the probability of shutdown by 8.6% and the probability of ceasing innovation without shutdown by 5.6%.

Berger et al. (2025) conduct a large-scale analysis of startup acquisitions and their effects on innovation, proxied by patent applications, across multiple countries and sectors. The main findings can be summarized as follows. First, they provide descriptive evidence about the characteristics of acquirers and acquired firms, showing that both startups and incumbents with more and higher-quality patents are more likely to be involved in acquisitions. Second, using a difference-in-differences approach, the authors find that startup acquisitions have a negative effect on innovation: acquired startups reduce patent filing relative to a control group of not-yet-acquired startups. Interestingly, this decline—attributed by the authors to startups ceasing patenting altogether after being acquired—is not offset by an increase in the acquirer's innovation activity (e.g., via follow-on innovations). Moreover, their heterogeneity analysis shows that these negative effects are stronger when the acquirer and the target have some overlaps (i.e., they operate in the same industry or geographical area).

3.2.2 Sector-specific studies

Pharmaceutical and Big Tech companies have engaged in numerous acquisitions of startups in recent years, a phenomenon that has drawn increasing attention from scholars (see e.g., Gautier and Lamesch 2021; Cunningham et al. 2021 for early evidence). In what follows, we review several recent studies—most of them unpublished at the time of

[43] The authors also examine GAFAM acquisitions. This part is discussed in Section 3.2.2 on sector-specific studies.

writing—that analyze the effects of startup acquisitions in the pharmaceutical and digital sectors.

Pharmaceutical sector Using a data set that includes detailed information on more than 16,000 projects in the period 1989-2010, Cunningham et al. (2021) study the effects of acquisitions on the development of the projects of acquired firms. A central aspect of their analysis is the identification of overlapping projects between the acquiring and acquired firms, which might lead to the emergence of the acquired firm as a future competitor of the incumbent. In their empirical analysis, the authors focus on the likelihood of post-acquisition project development by comparing projects with and without overlaps. The key finding is that acquired projects overlapping with the acquiring firm's portfolio are less likely to be developed post-acquisition. This result is shown to be robust across various model specifications.

In several extensions, the authors shed further light on killer acquisitions. First, they examine how the competitive environment influences the probability that a project is not developed post-acquisition. They find that killer acquisitions are more likely to occur in markets with less product competition. In other words, when there are fewer competitors in a market, acquiring firms have a stronger incentive to eliminate potential threats by acquiring and discontinuing the development of similar projects. Second, they study how the prospect of a patent expiration of the acquiring firm influences the probability of not developing the project of the acquired firm post-acquisition. They show that when the relevant patents of the acquiring firm are close to expiration, killer acquisitions are less likely to occur. Finally, they find that most of the acquisitions that are classified as killer acquisitions are below the threshold that requires a notification to the competition authority, thereby avoiding antitrust scrutiny.

While Cunningham et al. (2021) focus solely on product markets, Malek et al. (2025) study acquisitions in the antidiabetics sector and focus on both product markets and the technology space, the latter measured through patent-text similarity between acquirers and acquired firms for each R&D project. This study highlights the importance of considering both the product market definition, which is standard in industrial organization, and the technology space, borrowing from the innovation literature.

Specifically, the authors estimate the effects of acquisitions on project outcomes (i.e., termination, progression, and follow-up patenting) relative to similar projects not involved in acquisitions. A key novelty relative to the previous literature is their ability to trace the specific stage of development at which each project was subject to a transaction.

They find that the stage of clinical development at which the acquisition occurs is particularly relevant. *Late-stage acquisitions*, often characterized by high development costs but low failure risks, are relatively rare and less likely to have negative innovation

effects, as targets' projects are less likely to be terminated. Importantly, these late-stage transactions mainly involve firms not yet active in antidiabetics, either in the product market or in the technology space, indicating a strategic move to enter the antidiabetics product market. By contrast, *early-stage acquisitions*, which represent the majority of transactions and have high failure risks, have different patterns depending on overlap in product and technology markets. When the target and the acquirer have overlapping projects in both spaces, acquisitions are associated with lower termination rates and more follow-on innovations. This result, according to the authors, is consistent with potential synergies and with a *reverse killer acquisition* explanation. On the contrary, acquisitions by firms with no technological overlap with the target are more likely to result in project termination and fewer follow-on patents.

Digital sector Eisfeld (2025) studies the impact of innovative startup acquisitions on a firm's incentives to enter a market. She focuses on the software industry—a large and growing sector—and constructs a dataset that merges both Crunchbase financial information and product-level information that are web-scraped from *Capterra*, a vertical search engine for enterprise software. She uses product characteristics and descriptions from Capterra to classify products into distinct product markets using text-as-data methods.

The author identifies three different types of acquirers: *strategic acquirers* (companies that are active producers of enterprise software, e.g., GAFAM, Cisco, Oracle, Salesforce), *financial acquirers* (companies active in finance, e.g., Vista Equity Partners, TransUnion), and *outsider acquirers* (companies active in unrelated industries, e.g., Verizon, McDonald's). Strategic acquirers amount to 72% of all acquisitions that are first exits for VC-funded startups, whereas 9% are from financial acquirers. She finds that the majority of acquisitions end up with a product brand being discontinued after the acquisition, with the largest share (69%) occurring among strategic acquirers. Moreover, this share increases to 82% for the case of GAFAM acquisitions. She also presents a reduced-form model to study the effects of startup acquisitions on entry into a given market, and finds suggestive evidence that acquisitions deter entry.

Using a structural model, she shows that a higher expected acquisition or IPO in the future makes entry more profitable. However, acquisitions of major incumbents like GAFAM are followed by lower entry. Based on counterfactual simulations, she finds that blocking all acquisitions would lead to a decrease in startup entry up to 16% in the average market. By contrast, she finds that blocking only acquisitions by large, strategic firms would increase entry up to 1.5% in the concerned markets.

Focusing on the mobile app market, Affeldt and Kesler (2021) investigate how GAFAM competitors, in a given relevant online market, react to GAFAM acquisitions. They measure innovation through app updates and feature updates, where the latter includes

changes in app features, while quality is measured by the amount of user data collected. To identify the effect of GAFAM acquisitions, they employ a difference-in-differences approach, with the treatment group comprising competitors exposed to a GAFAM acquisition, and the control group comprising competitors who have not been exposed to such an acquisition. They find that, following GAFAM acquisitions, competitors tend to reduce their innovative efforts, both in terms of app updates and feature updates.

Jin et al. (2023) conduct a descriptive study of acquisition patterns over the period 2010-2020 by GAFAM firms and other major acquirers, including private equity firms and large tech companies such as Samsung and AT&T. First, they document that the high volume of acquisitions is a general feature of the tech industry and not exclusive to GAFAM. However, on a per-firm basis, GAFAM firms engage in acquisitions at a rate at least three times higher than that of the top 25 non-GAFAM tech companies (i.e., 119 vs. 41 acquisitions per firm). The number of GAFAM acquisitions peaked in 2014 and declined between 2018 and 2020.

Second, they show that top tech acquirers tend to acquire younger firms than other major acquirers, with average target age around 13 years, compared to 17-19 years for the top 25 private equity firms and S&P-listed firms. GAFAM firms acquire even younger targets, with an average age of just 8 years. Moreover, GAFAM firms tend to focus on targets with a stronger focus on business-to-consumer firms, and their acquisitions are less concentrated in a given category.[44] Specifically, they tend to acquire in adjacent markets and in markets in which the acquirer has entered via prior acquisitions. The authors refer to this encroachment dynamics as an *acquire-adjacent-and-then-expand strategy*.

Complementary descriptive evidence is provided by Alezra and Berquier (2024). Besides examining the effects of startup acquisitions on innovation across industries (as discussed in the previous subsection), the authors also present sector-specific results. The authors find that GAFAM acquisitions exhibit substantially greater patent overlap but lower sector similarity than the average acquisition, and that they are more likely to involve patent-owning or patent-applicant firms. As additional evidence, they show that firms acquired by GAFAM are more likely to cease operations within one year (i.e., 47% vs. roughly 20% for other acquisitions). They also document that, in GAFAM deals, targets exhibit the highest pre-acquisition patenting intensity but the lowest post-acquisition patent-application rates.

Gugler et al. (2025) study the impact of GAFAM acquisitions on venture capital (VC) investment and patenting activity using a difference-in-differences approach. The authors leverage a rich dataset from Crunchbase covering the period 1980-2020. For patents, the treatment group consists of technology classes directly affected by the acquisition,

[44] However, unlike other studies that directly measure product market or technological overlaps between acquirers and targets, the authors rely on S&P Level-1 and Level-2 industry classifications, which offer only coarse proxies for market definition.

which are compared to a matched control group of unaffected technology classes. For VC funding, the treatment group includes firms that, based on textual similarities in their descriptions, are likely to operate in the same VC technology segment as the firm targeted by the acquisition.

The authors find that post-acquisitions patents increased by approximately 72% relative to the control group, and that VC investment decreased by 70% relative to the control group for those companies that are technologically close to the acquirer. Interestingly, the econometric analysis presents significant heterogeneity across time and types of firms. The negative effect of acquisitions on VC investment is more pronounced for transactions occurring before 2010, with an estimated decline of 76%, compared to a smaller decline of 57% for the period 2010-2020. Similarly, the authors find no significant impact on patenting activity for acquisitions completed before 2010, and a positive impact for those completed between 2010 and 2020. Finally, they show that both patenting activity and VC funding tend to decline more when the deal value is not publicly disclosed, and when the acquired firms are relatively older—suggesting that, in the latter case, uncertainties related to the startup's competitive threat may have already been resolved.

Jin et al. (2024) provide supportive evidence for an opposite effect of acquisitions on VC investments.[45] They examine (more broadly) tech acquisitions and their impact on VC investment and startup funding, thereby testing the presence of the *innovation-for-buyout* effect in the context of VC activity, that is, whether a venture buyout increases VC investment in the target's business area.[46] The analysis compares all acquired ventures over the period 2014-2016 with a control group of comparable U.S. ventures that had raised at least one round of VC funding in 2014 and remained independent in 2015. Using a difference-in-differences approach, the authors find that acquisitions in a given business area lead to a 300% increase in the average amount of VC investment in that area, a 7% increase in the probability that a new startup secures VC funding, and a 1% increase in the probability of exit via IPO or acquisition. The authors also focus on large acquirers such as GAFAM and other prominent incumbents (e.g., Cisco, Verizon, Walmart), finding that acquisitions by these firms do not differ significantly in their effects from those carried out by other acquirers.[47]

de Barsy and Gautier (2024) examine acquisitions and innovation in digital markets

[45] While both studies rely on the Crunchbase dataset, Jin et al. (2024) and Gugler et al. (2025) differ along two key dimensions: time frame and sample. In terms of time frame, the former analyzes a relatively narrow window (2014-2016), whereas the latter covers a much longer period (1980-2020). In terms of sample selection, Gugler et al. (2025) restrict their analysis to startups holding patents, while Jin et al. (2024) examine all startups that have received VC investments, regardless of patenting activity.

[46] The authors refer to this mechanism as the *signaling effect* of an acquisition.

[47] These results are consistent with earlier evidence from Prado and Bauer (2022), who find that GAFAM acquisitions were associated with an increase in VC investment.

and seek to shed light on post-acquisition product discontinuation.[48] The authors consider the projects' underlying technology, trying to identify whether a technology continues to be developed after an acquisition, namely, whether a technology that the acquirer intends to develop receives more citations from the acquirer than one that is destined to stagnate. Focusing only on GAFAM acquisitions, they show an inverse U-shaped pattern: there is an immediate post-acquisition boost to the development of the acquired technology, as patent citations increase directly after the merger; however, this effect fades out after approximately 1.5 years. They show that the effect of acquisition on citations by the acquirer is highly heterogeneous. Specifically, the boost in citations is more likely to be present when there is a more novel technology as well as for patents belonging to small patent portfolios.

Next, the authors focus on technologies close to the acquirer's core activity—a different measure of overlap between the acquired and acquiring firms. On average, 49% of acquired firms hold patents in the acquirer's core technology area. Using an event study approach, they find that the observed increase in forward citations is driven by peripheral technologies (with little overlap), whereas the decline in forward citations is concentrated in core technologies. This pattern is consistent with the interpretation that acquisitions may be motivated, at least in part, by a strategy that softens competition in core technological areas.[49]

Ederer et al. (2025) examine approximately 1,000 technology acquisitions by GAFAM, Cisco, Intel, and Qualcomm, and proxy innovation by patenting activity within a given technological class.[50] They use an event-study design and a difference-in-differences framework to track how patenting within specific technological classes evolves after an acquisition of a target that had previously patented in those classes relative to the control group of untreated technological classes.[51] First, the authors find that post-acquisition patenting activity increases within specific patent classes. Yet, they show that innovation persists only in domains that see more than one acquisition, whereas it remains stable in technological classes in which there is no further acquisition. Second, they find that acquired patents receive more citations than comparable non-acquired patents within the same technology class and suggest that this result is consistent with improved dissemi-

[48] As argued by Gautier and Lamesch (2021), product discontinuation does not necessarily imply a killer acquisition, since the product might be rebranded or integrated into other functionalities.

[49] Ivaldi et al. (2025) also look at product discontinuation after tech acquisitions relying on public 10-K filings and merger cases notified to the European Commission. Their sample focuses on 12 transactions involving GAFAM and a few other large tech players. The authors classify market rivals and examine post-merger competitive dynamics using sales data from 10-K reports. Their main conclusion is that none of the reviewed transactions led to the discontinuation of the target's products.

[50] A further contribution of the paper lies in its analysis of acquisition effects on the workforce, which is beyond the scope of this discussion.

[51] While their initial analysis considers all untreated classes, they also provide an analysis where they use propensity score matching to identify a comparable control based on pre-acquisition patent growth and patent applications. We only discuss the latter results.

nation, commercialization or reuse of acquired knowledge. Moreover, they note that this effect is stronger in the context of follow-on acquisitions.

Doan and Mariuzzo (2023) analyze the impact of mergers and acquisitions on innovation in the U.S. cloud computing market using Crunchbase data from 2010-2019, Using patent data and a difference-in-differences strategy with matched controls, they show that acquired firms experience significant post-merger increases in innovation, with patent counts rising up to 66% after three years. The effect is especially strong (up to 212%) when the acquirer is a leading firm, and among multi-sided platforms, suggesting a role for cross-group network effects.

4 Vertical mergers

So far, we have focused on the effects of *horizontal* mergers on investments. We now turn to the impact of *vertical* mergers on investments—an issue that has recently attracted the attention of competition authorities.[52]

Vertical integration is generally understood to mitigate hold-up problems resulting from situations in which parties make non-contractible decisions (e.g., investment) before actual transactions occur (see, e.g., Williamson 1975, 1985, Klein et al. 1978, and Grossman and Hart 1986). Hold-up can reduce ex-ante incentives to invest, potentially leading to a lower level of investment than is socially optimal.[53] To see why, suppose that upstream firms negotiate their contracts with a downstream buyer only after having invested. They will tend to invest less than in a situation where contracts are negotiated before investment is made because they anticipate that they will capture a lower portion of the value created by their investment. Vertical integration can solve or mitigate this under-investment problem.

Allain et al. (2016) challenge this view by showing that vertical integration can, in some circumstances, be a source of, rather than a solution to, hold-up problems. They consider a setting in which two downstream competitors operate in a market with two upstream manufacturers. Before negotiations between downstream and upstream parties take place, downstream competitors make investment decisions. They examine two scenarios: one in which all firms are independent (*vertical separation*) and another in which there is *vertical integration* between one upstream supplier and one downstream retailer. They show that, due to upstream competition, there is no hold-up effect under vertical separation. However, under vertical integration, hold-up problems can arise for two reasons. First,

[52]For instance, in 2022 the European Commission prohibited Illumina's acquisition of GRAIL, a firm operating in the market for blood-based early cancer detection tests, on the grounds that the merger would stifle innovation.

[53]Note that this issue may arise for both investment in R&D and investment in physical capital or known technologies.

vertical integration can create ex-ante incentives to generate hold-up problems. Specifically, the integrated firm has incentives to commit to capturing or dissipating part of its downstream rival's profits, thereby subjecting the latter to hold-up by the competing supplier, which undermines its incentive to invest. Second, vertical integration can create ex-post hold-up issues when lowering the quality of support provided by a supplier to a downstream firm benefits the downstream competitor.[54]

Another paper that identifies a negative effect of vertical integration on downstream rival's investment is Loertscher and Riordan (2019). The authors consider the case of a firm exploring the simultaneous use of internal and external sourcing. Vertical integration eliminates double marginalization (*markup avoidance effect*), but induces independent suppliers to reduce their cost-reducing investment (*investment discouragement effect*). When upstream competition is intense leading to thin suppliers' margins, the markup avoidance effect is weak and, therefore, is more likely to be outweighed by the investment discouragement effect. The integrated firm, on the other hand, increases its investment effort.

Liu (2016) examines how vertical integration affects firms' incentives to innovate when innovation is relevant in only one market (upstream or downstream) or in both markets (upstream and downstream).[55] He considers a market with two upstream firms and two downstream firms. Investments are risky and stochastic, meaning that if an investment is unsuccessful, the associated firm exits the market. Investment occurs first upstream and subsequently downstream. After investment becomes observable, upstream and downstream firms negotiate terms if they remain in the market.

When innovation is relevant only upstream, vertical integration mitigates hold-up problems by improving coordination between parties. This leads to higher investment levels and greater total industry profits under integration compared to separation.[56] When innovation is relevant in both markets, vertical integration influences the level of innovation through an additional channel beyond solving hold-up problems. Specifically, when the downstream competitor also succeeds, integration encourages the integrated party to increase its downstream investment. Furthermore, better coordination and complementarity between investments also foster upstream investment within the integrated firm.

Finally, Chambolle and Guignard (2025) study how vertical integration (without foreclosure) affects upstream quality-enhancing investments in a setting in which a downstream retailer has buyer power and investment may generate positive spillovers for a

[54]Similar results are found in an experiment by Allain et al. (2021), which supports the finding that vertical integration can exacerbate hold-up concerns and lead to lower investment levels.

[55]Also other studies focus on investment undertaken either upstream (Brocas, 2003; Chen and Sappington, 2010) or downstream (Bolton and Whinston, 1993; Buehler and Schmutzler, 2008). However, in several industries (e.g., pharmaceuticals), investment occur at both levels.

[56]When innovation is relevant only downstream, investment is not affected by vertical integration.

rival.[57] They develop a model comparing a scenario in which two independent manufacturers sell to a single downstream retailer (*vertical separation*) with a scenario in which one manufacturer integrates with the downstream retailer who also buys input from the independent manufacturer (*vertical integration*). After investment takes place, the upstream and downstream parties negotiate a non-linear tariff, allowing the authors to abstract from efficiency gains typically associated with the elimination of double marginalization. However, another distortion is present, taking the form of a standard hold-up problem.

The authors find that vertical integration removes hold-up problems and increases the bargaining power of the integrated retailer in its negotiations with the independent manufacturer. These two effects boost the innovation incentives of the integrated entity but may either increase or decrease the independent manufacturer's incentives to invest, depending on the level of spillovers: when spillovers are high (which implies in their model that investments are strategic complements), vertical integration encourages the independent manufacturer to invest, whereas with low spillovers (which implies that investments are strategic substitutes), it reduces its investment.

5 Conclusion: Policy insights and directions for future research

This literature review has focused on three issues: the impact of mergers between competing incumbents on firms' incentives to invest, the effect of acquisitions of potential competitors on the investment incentives of the acquiring and acquired parties, and the impact of vertical integration on the incentives to invest.

On the theoretical side, the literature shows that the impact of a merger on investment typically results from several potentially opposing effects. It identifies various factors affecting this impact, as well as conditions under which the net effect is positive or negative. On the empirical side, evidence is mixed—a result that is not surprising given the ambiguous predictions offered by theory.

Importantly, the literature offers several insights that can inform the decisions of policymakers and competition authorities. We highlight some of them below.

Unilateral effects: prices vs. innovation. The assessment of a horizontal merger by a competition authority typically begins with an analysis of its unilateral effects, that is, the effects in the absence of any coordinated behavior among firms. With respect to prices, this analysis involves a classic trade-off between two opposing forces. On the one hand, the merger generates a price-increasing effect as each firm internalizes the adverse impact of lowering the price of its product(s) on the profits of its merging partner. On

[57] An alternative interpretation provided by the authors is that firms invest in advertising.

the other hand, the merger may generate a price-decreasing effect by enabling efficiency gains, such as reductions in marginal costs. The literature reviewed in this paper identifies counterparts to these two forces for innovation, but shows that the analysis of the unilateral effects in innovation involves a richer set of mechanisms than in the case of prices.[58] The main reason is that a merger alters the merging firms' ability to appropriate returns from innovation. This can occur through at least two channels: first, a merger typically leads to a change in product prices, which in turn affects the value of innovation for firms; and second, a merger leads to the internalization of R&D spillovers between the merging parties. This implies that the standard framework for assessing price effects cannot be directly transposed to innovation.

Type of innovation and price effects matter. The literature suggests that the effects of horizontal mergers on quality-enhancing investment are more complex than those on cost-reducing investment.[59] For instance, in a setting with deterministic innovation, simultaneous setting of prices and investments, and no spillovers or R&D synergies, the impact of a merger on the merging firms' incentives to reduce marginal costs of production is entirely driven by its effect on prices (holding investment fixed at its pre-merger level). Specifically, the merger reduces such cost-reducing investment if and only if it has an adverse effect on prices. This implies that analyzing price effects is sufficient to infer the impact on investment in this case. This logic, however, does not apply to quality-enhancing innovation, where investment directly affects demand. As a result, a merger can alter investment incentives even if prices remain unchanged. That said, even for quality-enhancing innovation, some of the effects on investment are still driven by price changes. A practical implication of this observation is that any analysis of a merger's impact on investment should come after, and be grounded in, an analysis of its effect on prices (holding investment fixed). In particular, factors that affect the sign and magnitude of a merger's price effect—such as production synergies or barriers to entry—are likely to influence its effect on investment. In addition, remedies designed to address the adverse price effects of a merger may also affect investment.

Effect on consumer surplus. Horizontal mergers between incumbents can, in some cases, have positive effects on investment while adversely affecting prices. In such instances, the net impact on consumer surplus is *a priori* ambiguous.[60] However, in many commonly used models with initially symmetric, single-product firms competing in prices and R&D, and with not too steep R&D cost functions, a merger leads to a decrease in consumer surplus in the absence of spillovers and synergies (in R&D or production).[61]

[58] See, e.g., Moraga-González and Motchenkova (2026).

[59] See, e.g., Motta and Tarantino (2021) and Bourreau et al. (2024).

[60] By contrast, a horizontal merger that adversely affects both prices and investment is unambiguously harmful to consumers.

[61] See, e.g., Federico et al. (2018), Motta and Tarantino (2021), Bourreau et al. (2024), and Moraga-González and Motchenkova (2026).

The literature also shows that the presence of spillovers or synergies can overturn this result.[62]

Short- vs long-term effects of start-up acquisitions. The literature highlights a potential tension between the short- and long-term effects of start-up acquisitions on consumer surplus, suggesting that optimal merger policy depends on the time horizon adopted by competition authorities. Two different interpretations of the short- and long-term have been proposed. The first defines the short-term effect as the static impact on prices for a given level of innovation, and the long-term effect as the impact of the prospect of being acquired on the incentives for start-ups to invest (the *innovation-for-buyout effect*).[63] In this framework, a merger may harm consumers in the short term but benefit them in the long term. The second distinction applies to a setting with repeated acquisitions by an incumbent. Here, the short-term effect refers to the innovation-for-buyout mechanism associated with a single acquisition, while the long-term effect captures the cumulative impact of multiple acquisitions.[64] This scenario is particularly salient in digital markets, where several leading platforms have engaged in a series of start-up acquisitions.[65] In such cases, acquisitions may initially stimulate innovation and benefit consumers, but over time, they may entrench the incumbent's dominance, ultimately reducing innovation and harming consumer surplus.

Additional factors to be considered in the assessment of start-up acquisitions. Related to the above point, the literature suggests that a forward-looking competition authority may find it optimal to approve acquisitions by incumbents whose market power remains below a certain threshold and to block those by incumbents that exceed it, potentially due to previous acquisitions.[66] The history of past acquisitions and the resulting market power of the acquirer are, therefore, relevant factors that competition authorities could take into account. The literature also suggests that the price paid for a start-up can serve as an indicator of the acquisition's impact on welfare. A related policy recommendation is that competition authorities should commit to a merger policy that blocks high-price takeovers of start-ups and permits low-price ones.[67] The above factors are particularly relevant for assessing start-up acquisitions in digital markets as traditional merger review tools, such as market shares and mark-ups, are often not suited to the specific features of these markets.[68]

[62] See, e.g., Federico et al. (2018), López and Vives (2019), Denicolò and Polo (2021), and Moraga-González and Motchenkova (2026). For a more general discussion about the implications of spillovers and synergies for merger review in R&D-intensive industries, see Régibeau and Rockett (2019).

[63] See, e.g., Hollenbeck (2020).

[64] See, e.g., Denicolò and Polo (2025).

[65] See, e.g., Fumagalli et al. (2025) for evidence on this and for a policy-oriented discussion of the effects of digital mergers on competition and innovation.

[66] See Denicolò and Polo (2025).

[67] See Fumagalli et al. (2024).

[68] See Fumagalli et al. (2025) for a broader discussion of this issue and additional policy recommendations

Finally, our literature review shows that many important topics related to the effects of mergers on investments remain underexplored. We outline below a few directions for future research. Addressing these questions would help strengthen the theoretical foundations needed to provide more robust guidance to policymakers and competition authorities.

Effects on outsiders. The theoretical literature on the impact of horizontal mergers on investments has primarily focused on the merging parties' investment decisions. While a few studies have provided insights into the effects on non-merging parties' investment, our understanding of these effects remains relatively limited. A key difference between the impact of a merger on outsiders' prices in settings where the only strategic variable is the price and the impact of a merger on outsiders' investment in a setting where there are two strategic variables (prices and investment) is that even if a merger does not affect the merging parties' investment incentives, it may still affect the non-merging parties' investment through its effect on prices.[69] Such a *direct* effect on non-merging parties can substantially complicate the analysis, and its implications warrant further investigation.

Asymmetries. Most of the theoretical literature on the effects of mergers between incumbents on investments focuses on settings with symmetric firms. This is primarily due to the tractability issues that arise in oligopoly models with multiple strategic variables when firms are asymmetric. While some of the few papers that consider extensions to asymmetric settings show the robustness of findings derived under symmetry,[70] other studies suggest that some results in the literature may not carry over qualitatively once symmetry is relaxed.[71] Further research in this area would be highly valuable, as many—if not most—real-world mergers occur in industries characterized by firm asymmetries.

Multi-product environments. The literature examining the welfare effects of mergers in settings where firms may offer multiple, vertically differentiated, products in the same market shows that these effects can differ substantially from those predicted by traditional single-product models.[72] Also, the very few papers examining the effects of mergers on innovation in multi-market settings identify mechanisms that can alter their impact on consumer surplus relative to single-market settings.[73] The effects of mergers on investment incentives and consumer surplus in multi-product environments therefore warrant further analysis.

Intellectual property. We are not aware of any theoretical study that explores how the strength of intellectual property (IP) rights affects the impact of a merger on invest-

on merger review in digital markets.

[69] See, e.g., D'Annunzio et al. (2025)

[70] See, e.g., Moraga-González et al. (2022), Bourreau et al. (2024), and Moraga-González and Motchenkova (2026).

[71] See, e.g., Baranes and Vuong (2021).

[72] See, e.g., Johnson and Rhodes (2021).

[73] See Moraga-González et al. (2022) and Moraga-González and Motchenkova (2026).

ment in innovation. The answer to this question is far from obvious. On the one hand, strong IP rights limit *involuntary* spillovers (such as those resulting from imitation). Since the internalization of such positive spillovers by the merging parties can increase their investment incentives, a reduction in these spillovers makes it more likely that the merger will decrease their incentives to invest. On the other hand, stronger IP rights also expand the potential for *voluntary* spillovers—instances where innovations that would otherwise benefit only one of the merging parties absent a merger would be shared within the merged entity. An increase in these voluntary spillovers raises the marginal benefit of investment in innovation, making it less likely that the merger will reduce the parties' incentives to invest. Understanding the circumstances under which the latter force dominates, or is dominated by, the former, would provide valuable insights.

Conglomerate mergers. Most of the literature on the effects of mergers on investments has focused on horizontal mergers. As discussed in Section 4, a growing body of literature has also examined the impact of vertical mergers on investments. However, the effects of mergers between firms producing complementary products on investment are largely underexplored.[74] Note that models analyzing the effects of horizontal mergers on investment with general demand functions (e.g., Bourreau et al. 2024) can, in principle, be adapted to study the effects of mergers between complementors by assuming that demand functions decrease with the prices of other firms. A related, equally underexplored, issue concerns the effects of acquisitions of start-ups developing complementary, rather than substitutable, products. Such startups do not threaten the incumbent's market position (at least in the short run) and their acquisitions may contribute to the development of ecosystems. The economic mechanisms at play may therefore differ substantially from those arising when the start-up has the potential to displace the incumbent by developing a superior substitute.[75]

[74] A notable exception is Etro (2019).
[75] See e.g., ongoing work by Azzali et al. (2025).

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