Killer Acquisitions

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Killer-Acquisitions – acquisitions in which an acquirer abandons the product development of a target firm after having acquired it – have been a growing concern of policy makers, especially given the high mergers and acquisitions activity of Big Tech. This paper offers a survey on the recent literature on startup acquisition, and what criterions antitrust authorities should pay attention to when evaluating a merger between an incumbent and a startup.

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JEL Classification: K21, L41, L13

I. Introduction

"It is better to buy than compete."

—*Mark Zuckerberg,* in a 2008 email

"One thing about startups though is you can often acquire them."

—*Mark Zuckerberg*, in a message to a collaborator after acquiring Instagram in 2012

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Facebook has been through tremendous changes between the years 2008 and 2012: its userbase increased tenfold, going from 100 million to 1 billion active users, and it went public in May 2012. One thing that did not change during those four years, however, is its CEO's stance on startups: it is easier to acquire them than to compete with them.

Tech Giants have more than often relied on the acquisitions of startups to innovate and grow, some of those acquisitions being essential to their current success. For example, Google (now Alphabet) acquired Applied Semantics in 2003, which developed the AdSense program, allowing publishers to serve targeted advertising within their content. AdSense is now one of Alphabet's main sources of revenue.

Other notable acquisitions from Tech Giants include Alphabet's acquisitions of Android, the mobile operating system, in 2005, and YouTube, the online video sharing platform, in 2006, but also Facebook's acquisitions of Instagram in 2012 and WhatsApp in 2014, or Microsoft's acquisitions of LinkedIn in 2016 and Skype in 2011.

While the products behind all those acquisitions are still on the market, this is not always the case, especially given the volume of acquisitions made by those Tech Giants. Between 2015 and 2017 for example, the "GAFAMs" (Google, Amazon, Facebook, Apple, Microsoft) have made 175 acquisitions, more than 60% of which were discontinued (see Gautier and Lamesch, 2022). Google is known to kill off many of its products and services, so much that a website is dedicated to listing all such products. As of today, 293 are listed of having been killed by google.[1, 2]

So why do Tech Giants acquire so many startups, especially if it is to discontinue their product offerings?

One possibility is that investing in research and development (R&D) to develop products that will challenge the "status quo" operated by large established firms is often difficult for them.[3] As such, it may instead be easier to purchase the startups which may challenge this status quo in the near future, even if this means eventually discontinuing their products if those do not turn out to be successful.

[1] https://killedbygoogle.com, visited on January 22, 2024.

[2] For example, Google shut down Aardvark, a social-search question and answer site, less than two years after acquiring it in 2010.

[3] See Henderson and Clark (1990) and Christensen (1997).

Another possible reason, however, is that Tech Giants acquire many startups to suppress future competition. Looking at data from the pharmaceutical industry, Cunningham, Ederer, and Ma (2021) estimate that between 5% and 7% of acquisitions are killer acquisitions. Policymakers are becoming warry of acquisition practices by Big Tech, and in 2021, the US Federal Trade Commission filed an antitrust suit against Facebook, partly for its "anticompetitive acquisition strategy" to "eliminate threats to its monopoly."

This paper offers a survey of the recent literature which covers mergers between incumbents and startups. First, Section 2 lays out some basic ideas behind merger control. Section 3 then looks more specifically at which factors antitrust authorities should take into account when considering a merger between an incumbent and a startup. However, antitrust authorities must also consider the impact their stance on mergers may have on innovation: Section 4 offers a discussion on the ex-ante effects of merger policy on innovation by startups. Finally, Section 5 concludes.

II. Merger control

A. Mergers and welfare

Basic economic theory will tell us that welfare is maximized when markets are competitive, and that concentrated markets generate inefficiencies. All else equal, a merger reduces the number of firms in a market, thus lessening competition and welfare. Of particular concerns to antitrust authorities are what we call "unilateral effects" and "coordinated effects."

We talk about unilateral effects when, after a merger, the merged entity has enough market power that it can now unilaterally increase prices. Coordinated effects refer to the increased possibility of collusion between market participants after a merger. This will be the case when there are fewer firms operating, which is the case after a merger, but also when market participants are less asymmetrical, which can be the case if, for example, two small firms were to merge.

Why, then, would an antitrust authority concerned with welfare consider allowing mergers? The answer is often found in efficiency gains: a merger can result in synergies which could, for example, reduce the production costs of the merged entity. If the cost reduction

is sufficiently large, then it can compensate the loss of welfare due to the lessening of competition, and the merger's overall effect on welfare could be positive.[4]

The role of merger control is thus to ensure that mergers and acquisitions will not lessen competition nor create a monopoly. For example, US merger guidelines aim to "promote open and fair competition," and Section 7 of the Clayton Act prohibits mergers and acquisitions which "may substantially lessen competition, or tend to create a monopoly."

Similarly, EC Merger Regulations state that "major corporate reorganizations, particularly in form of concentrations" should "not result in lasting damage to competition," while the UK Competition and Markets Authority states that its role is to "investigate mergers between organisations, to ensure that they do not result in a substantial lessening of competition."[5]

B. Mergers and potential competition

When mergers involve small startups that have yet to make an impact on the market, it may be difficult to argue that such mergers do in fact lessen competition. However, various competition authorities not only consider immediate threats to competition, but also the threat from the elimination of potential future competition.

US merger guidelines number 4 states that "mergers can substantially lessen competition by eliminating a potential entrant," in particular in concentrated markets. Similarly, the UK CMA recognizes that "a merger with a potential entrant may imply a loss of the future competition between the merger firms after the potential entrant would have entered or expanded."

C. Tools for merger control

Competition authorities have various quantitative and qualitative tools to evaluate the impact of mergers on competition. We discuss

[4] Some mergers, however, have a small impact on competition, and should be allowed to go through on the basis of economic freedom. This is why antitrust authorities usually look at market shares before deciding whether investigating a merger.

[5] CMA Merger Assessment Guidelines (CMA129)

some of those tools below.

Price correlations: one of the first steps when assessing a merger is to determine the relevant market, and whether the merging firms belong to the same market. Price correlations can help determine whether this is the case or not, as products or services showing a high degree of correlation are likely to be part of the same market.

Diversion ratios: diversion ratios look at how likely consumers are to switch from one product to another after a price change. They are used to assess the substitutability between two products, and thus the possible anti-competitive effects of a proposed merger.

Event studies: event studies in merger control look at how stock prices react to a merger announcement. Such studies can shed a light on market expectations regarding the degree of competitivity and profitability of a market after an announced merger. Event studies can be used to determine the relevant product and geographic markets, but also assess the efficiency gains claimed by merging parties.

HHI and merger simulations: the Herfindahl-Hirschman Index is a quantitative measure of market concentration which uses market shares as an input. Merger simulations can be performed using game-theoretical models of imperfect competition. From those simulations, one can then estimate market shares after a proposed merger, and compute an estimate of the post-merger HHI. The post-merger HHI levels, as well as the changes in the HHI, might then trigger a more thorough merger review.

III. Mergers with startups

Startups are companies that are in the early stages of development, using working on developing new ideas and products. As such, they do not often offer a viable product yet, and if they do, they may have a small or zero market share, often incurring important losses to focus on user acquisition.

This makes it difficult to use the quantitative tools described in Section 2, such as price correlations, diversion ratios, event studies, or HHI, to evaluate a merger when the target firm is a startup.

Furthermore, mergers with startups involve a significant degree of risk and uncertainty, rendering counterfactual analysis and merger simulations more challenging. Indeed, because of uncertainty, there

can be a large number of different plausible counterfactual scenarios to consider, most likely leading to disagreements between the antitrust authorities and the merging parties as to which counterfactuals are the relevant ones.

For example, note that when Facebook (now Meta) acquired Instagram in 2012, the competition authorities did not consider Facebook and Instagram to be in the same market. Instead, they considered Facebook as a social network service provider, and Instagram as a photo-sharing app. But products and services can evolve quickly, especially in the tech sector, and it is now clear that Instagram offers a substitute service to Facebook, and would have competed with Facebook had it not been acquired. While Meta still makes more than half of its revenue from Facebook, the share of ad revenue from Instagram is growing faster and could soon outpace the ad revenue from Facebook.

Given the difficulty in using the standard quantitative tools of merger control, how can an antitrust authority evaluate the impact of a merger with a startup? Below, we outline some important factors which should be considered, based on recent research by Guéron and Lee (2024), Fumagalli, Motta and Tarantino (2023), and Motta and Peitz (2021).

A. Startup lifecycle

As mentioned, one aspect which distinguishes startups from established firms is the significant degree of risk and uncertainty surrounding product development. However, those levels of risk and uncertainty may not remain constant throughout the startup's lifecycle, and as such, an antitrust authority should take into account such dynamic considerations when having to evaluate a merger with a startup.

Indeed, while startups involve risk and uncertainty, they also evolve dynamically in a fast-moving environment. As such, learning occurs, and can occur fast. A startup may start investing in R&D because it is very optimistic about its chances of succeeding, and, absent of a success, may quickly become more pessimistic.

Such belief dynamics are common in what are known as "good news" models of learning. In such models, information only arrives in the form of good news, for example with new discovery on an R&D line, or rapid user adoption of a new service. When such good news fails to arrive, firms will become more pessimistic about their chances of success: the

project they are investing their R&D efforts on might not be feasible, or users may not be interested in the product or service they have to offer.

Guéron and Lee (2024) are among the first to develop a dynamic model of startup investment in R&D and mergers. Initially, an optimistic startup invests in R&D, not knowing whether R&D can be successful or not. As time passes, if no good news arrives (i.e., if R&D has not proven to be successful yet), the startup becomes more pessimistic about its chances of success.

While the startup is performing R&D, an incumbent can make an offer to acquire the startup, and then decide whether to pursue with R&D or shut it down. A merger offers the following tradeoff: the merger generates immediate synergies, increasing the welfare generated by the incumbent; however, there is the potential for innovation, if successful, to generate more surplus if it has been developed by the startup rather than the incumbent.[6]

In this setting, merger policy should be dynamic: early in the life of the startup, when it is most optimistic, a merger with the incumbent would lower expected surplus, as the expected gain from the startup innovating is higher than the immediate synergies from the merger. However, as the startup becomes more pessimistic about its chances of success, the expected gain from innovation is reduced, and allowing the merger based on the synergies eventually becomes better for welfare.

B. Incomplete information

As seen above, whether a merger with a startup is beneficial to society or not may depend on the lifecycle of the startup. Early mergers, when the startup is still optimistic about its chances for success, might be detrimental to welfare, while late mergers, when the startup has become sufficiently pessimistic, might be beneficial due to immediate synergies.

In their baseline model, Guéron and Lee (2024) show that with perfect information, the private incentives regarding the merger align with

[6] In the paper, if the incumbent generates more surplus than the startup, then there is no longer a tradeoff: all mergers are beneficial to welfare, due to synergies. The assumption that the startup may generate more surplus than the incumbent is not unlike the assumption that a merger reduces surplus because of the loss of competition.

society's incentives: that is, whenever a merger is agreed, it is welfare enhancing, and whenever a merger is not agreed, it would have been detrimental to welfare.

This conclusion changes when information is no longer perfect, and there is asymmetric information regarding the ability of the startup to generate surplus. Even though the innovation remains the same, the success of its commercialization may depend on how the successful firm chooses to market its successful innovations. Some startups may be better than others at that, and generate a high surplus post innovation, while others may generate a lower surplus. While this is known by the startup, the incumbent does not know which type of startup it is facing.

When making a buyout offer, the incumbent can choose one of two prices: a low price, which will only be accepted by the low type startup, or a high price, which will be accepted both by the low and high type startups.

When making a high-price offer, the incumbent must give up an information rent and pay a higher-than-expected price in order to not risk the merger from failing. This causes the incumbent to delay the time at which it would normally make a high-price offer, and leads to some efficient mergers not being realized: because the price is, on average, too high, there are now some mergers which would be beneficial to society and for which the incumbent no longer makes an offer. This is what Guéron and Lee (2024) call "failed mergers."

From an antitrust perspective, however, failed mergers do not cause for intervention: if a merger is agreed, then it is efficient.

C. Private returns to R&D

In Guéron and Lee (2024)'s dynamic model of mergers and learning, merger policy is in threshold: mergers occur once firms become pessimistic enough about the possibility of success.

With complete information, mergers are efficient, and efficient mergers occur. However, with asymmetric information, the incumbent delays its offer because of adverse selection, which causes some efficient mergers not to be realized.

In Guéron and Lee (2024)'s baseline model, the monopolist can appropriate all the surplus from the innovation through its market activity. They then introduce another source of market friction: the size

of private returns to R&D. In this extension, the monopolist no longer appropriates the full surplus from its innovation. Such imperfections can occur when the monopolist is not able to perfectly screen consumers, or when surplus extend beyond what the monopolist earns, for example through knowledge spillovers and other externalities.

While having imperfect private returns reduces the profits made by the incumbent, and thus reduces its incentives to purchase the startup from preemptive motives, it also reduces the price the incumbent has to pay to purchase the startup. Thus, it is not clear what effect it might have on the timing and efficiency of mergers.

Through some numerical simulations, Guéron and Lee (2024) show that under imperfect returns to R&D, the incumbent may now purchase the startup at more optimistic beliefs, when it is still not desirable from society's point of view.

Thus, imperfect returns to R&D open up the possibility of inefficient mergers, which may require antitrust intervention. Such mergers occur when the probability of success is high enough, but when private returns to R&D are low.

D. Bargaining power

In Guéron and Lee (2024), when a bargaining opportunity arrives, it is the incumbent who makes a take-it-or-leave-it offer to the startup. Therefore, the incumbent has all the bargaining power.

Giving some bargaining power to the startup would increase the price the incumbent has to pay, which would in turn make the incumbent delay its purchase. With perfect returns to R&D, this would increase the phenomenon of failed mergers. However, with imperfect returns to R&D, some mergers can be inefficient. In that case, having more bargaining power for the startup may decrease the inefficiency.[7]

E. Network effects and incumbency advantage

An additional concern when it comes to acquisitions by Big Tech is that a lot of technological products and services benefit from increasing

[7] Other papers point to the importance of bargaining power when considering the acquisitions of startups, such as Cabral (2018), Letina, Schmutzler and Seibel (2021), or Callander and Matouschek (2022), or Kamepalli, Rajan and Zingales (2022).

returns to scale and network effects.

Network effects occur when a product or service's value to consumers increase with the number of users. For example, a social network platform has little value if no users are on it, but becomes more compelling as its number of active users increases.

In sectors with strong network effects, an aggressive acquisition strategy may be a good way for an incumbent to keep growing and increasing the gap with the competition, thereby cementing its incumbency position. That is, network effect can increase the anticompetitive nature of the acquisition of a startup.

Nevertheless, the tech sector evolves at a fast pace, and dominant firms eventually get replaced by newcomers. Consider for example the dominant social network services over time. Friendster, which launched in 2002, is considered to be one of the first social network services. But Friendster was eventually overtaken by MySpace, and MySpace by Facebook. Nowadays, Facebook has lost a lot of its appeal for younger generations, who prefer to use platforms such as Snapchat (which started as a self-destructing messages chat app), Instagram (owned by Facebook/Meta), or TikTok.

Furthermore, having a large number of users, and thus benefiting from large increasing returns and network effects, is not a guarantee for success. Google, which had more than 1.5 billion Gmail users in 2011, did not manage to leverage this userbase into a success for the launch of its own social network, Google +, which eventually shut down in 2019.

F. Credit rationing / Insufficient resources

The standard tradeoff involved in merger reviews is the tradeoff between synergies and the loss of competition. However, mergers involving startups must have us consider innovation, and whether innovation could actually be developed by the startup.

This is the idea behind two papers, Fumagalli, Motta and Tarantino (2023) and Motta and Peitz (2021). Both papers argue that the merger of a startup with an incumbent could in fact help the startup develop its innovation and bring it to the market, but they offer two different explanations: inefficient credit rationing, or limited resources.

Fumagalli, Motta and Tarantino (2023) consider a model with inefficient credit rationing, in which some types of startups may not be

able to secure sufficient funding to bring its innovation to market. As with Guéron and Lee (2024), there is asymmetric information regarding the type of the startup, and the incumbent can choose to make an offer accepted by all types of startups, or a lower offer that will be accepted only by the financially constrained startups. However, unlike in Guéron and Lee (2024), mergers with the "high-type" startup, the one which is not financially constrained, is always inefficient.

In Motta and Peitz (2021), developing the startup's product requires a sufficient amount of resources (such as data, expertise, or assets), and the startup may not possess enough of those resources. Allowing the merger might therefore be beneficial if the antitrust authorities believes that the product would not come to market otherwise, due to a lack of resources of the startup. The challenge for the antitrust authorities lies in identifying the relevant counterfactual: would innovation proceed without the merger?

G. Price

With asymmetric information about the startup, the price of a merger can convey information to the antitrust authorities. Namely, a low price may indicate a low-type startup, while a high price may not help with the antitrust authorities' beliefs, as all types of startups would accept such a price.

Both in Guéron and Lee (2024) and Fumagalli, Motta and Tarantino (2023), a low price is usually not a cause for concern for the antitrust authorities, as it involves a merger with a low type, and in both models, mergers with low types are efficient.

In Fumagalli, Motta and Tarantino (2023), mergers which occur at a high price are the only one which can cause concerns for innovation, as they may involve an incumbent killing off an innovation which would have been developed by the startup if it would have continued on its own.

In Guéron and Lee (2024), however, a high price is not necessarily the sign that antitrust authorities must intervene, as the information rent an incumbent must pay to acquire the high-type startup leads to an inefficiency in the form of failed mergers.

Nevertheless, both papers show that price can convey important information when evaluating a merger, whether about the feasibility of R&D, the type of the startup, or both. Antitrust authorities should

therefore pay closer attention to it when trying to evaluating a merger.

H. Innovation

As implied by the name "killer acquisitions," it is often the case that mergers with a startup reduce innovation, as the incumbent kills of the projects in development by the startup. But it is not obvious whether this is a good or bad thing, as startups may be over-investing in R&D in the first place. Incentives to innovate and merger policy are discussed in details in the next Section.

IV. Mergers and incentives to innovate

Until now, we have focused on whether a merger with a startup should be approved by antitrust authorities, and listed a number of factors which could affect this decision, such as learning dynamics or asymmetric information. In this section, we now look at the links between merger policy and innovation.

Note that there are two ways to think about the link between mergers and innovation. First, we have to consider the ex-post R&D incentives of an incumbent after having acquired a startup: will it pursue the R&D projects of the startup or kill them off, and is this beneficial to society?

But we also have to consider how merger decisions affects ex-ante incentives to innovate. While no single merger decision by an antitrust authority may influence future startups, the general stance of an antitrust authority towards mergers may have an impact on R&D, innovation, and entry decisions of startups. For example, a lenient policy towards mergers may spur innovation from startups, with the hope of eventually being acquired – the "invention-for-buyout" effect.

Yet, in the presence of network effects, we will see that there can also be concerns that a permissive merger policy might create a "kill zone" and slow down innovation.

A. Innovation, growth, and mergers

A key idea in growth theory is the one of "creative destruction," put forward by Schumpeter. In order to successfully enter a sector, new firms would have to innovate and offer a product or service better or more efficient than the one offered by incumbents, eventually forcing incumbents to exit. Endogenous growth theory is based on this insight,

and in their seminal paper, Aghion and Howitt (1992) show that higher competition, through a higher rate of entry and exit, would lead to a higher growth, shedding a light on the important role of innovation in the growth process.

Moreover, startups often put in more efforts to innovate than incumbents, due to what is known as the "Arrow replacement effect" (Arrow, 1962). The idea being that, when a monopolist innovates, it only replaces itself, whereas when a new entrant innovates, it replaces the monopolist. Thus, the benefits from innovation are more important for new entrants, who therefore innovate more.

Nevertheless, we can also question whether firms innovate too much. For example, Silicon Valley has been riddled with inventions that, in hindsight, should have never seen the light of day.[8]

There are several reasons why firms may in fact invest too much in R&D. For example, in Guéron and Lee (2022), an innovating firm faces the risk of imitation if bringing its product early on the market. It may then choose to over-invest in R&D to make its technology more difficult to imitate.

In a more recent paper, Guéron and Lee (2024) show that when the Arrow replacement effect holds, startups may continue R&D longer than what is warranted by social efficiency, precisely because they do not take into account the welfare accrued from the incumbent's market activity.

Awaya and Krishna (2021), in the context of an R&D race, demonstrate the existence of a new Arrow replacement effect, due to information asymmetries: incumbents, who have more information about the feasibility of R&D, exit from the race earlier than entrants. However, due to the competitive nature of the winner-takes-all contest, firms do tend to overinvest in R&D.

[8] For example, Juicero was an American company which received $120 million from investors to develop the Juicero Press, a $700 juicing press, which had to be used in coordination with juice packs which cost between $5 and $7. The "innovation" of Juicero was that each juice pack came with a QR code, and that the Juicero Press would read those before producing its juice, to make sure that the product was fresh enough. While Juicero praised the power of its juicer, a story from Bloomberg news showed that the same quantity of juice could be obtained by squeezing a juice pack by hand, rather than in the machine. Juicero suspended sales of its press and fruit packs less than a year and a half after its initial launch.

Federico, Langus and Valletti (2017) consider an R&D race situation with mergers. Similar to Awaya and Krishna (2021), the winner-takes-all nature of the R&D contest pushes firms to innovate. After a merger, such incentives are reduced for the merging parties. Denicolò and Polo (2018), however, show that this result can change if firms can choose an asymmetric R&D policy. In that case, mergers can lead to more innovation.

B. Invention-for-buyout effect

It has been known for a long time that merger policy can influence entry decisions of new firms. Rasmusen (1988) calls this "entry for buyout." In his model, the possibility of buyout gives incentives to a potential entrant to actually enter the market, incentives which would not be there if it were not for the possibility of buyout. Entering the market and keeping prices low exerts pressure on the incumbent, who then prefers to buy out the entrant.

Denicolo and Polo (2021), in a repeated innovation model, uncover a phenomenon akin to Rasmusen's entry for buyout, which they call the "invention-for-buyout" effect. In the same way that firms may enter to be acquired, small innovators want to be acquired, which is why they start innovating in the first place.

Similarly, Bisceglia, Padilla, Perkins and Piccolo (2023), stress how the exit value affects a challenger's incentives to invest. A restrictive merger policy, while strengthening competition in the product market, will also reduce the challenger's exit value, and thus lowers its incentives to innovate. Thus, letting killer acquisitions go through, while reducing innovation after a merger, will stimulate ex-ante innovation by startups who want to be purchased.

However, Denicolo and Polo (2021) offer some caution, by distinguishing between the short-run and long-run effects of a permissive acquisition policy. As mentioned, in the short run, the prospect of a buyout generates an invention-for-buyout effect and stimulates innovation. However, in the long run, a permissive acquisition policy will allow an incumbent to strengthen its dominance through acquisitions. This makes it more difficult for new entrants to enter the market, which reduces the share they might get in case of a buyout, therefore reducing their incentives to innovate.

C. The direction of innovation

As we have seen, merger policy can influence startups in their decisions to innovate, and more innovation is not always necessarily better. More recently, a series of papers have been investigating not only whether efforts to innovate are efficient, but also whether they are going in the right "direction."

Bryan and Hovenkamp (2020) put forth three question to consider when evaluating the innovation efforts of a startup. First, if a startup develops a new technology, is it licensed to the correct incumbents? Second, does the startup choose to invest on the right technology? And third, does it invest an efficient amount of money into R&D? Those three questions correspond to what Bryan and Hovenkamp call the *diffusion,* the *direction,* and the *rate* of startup activity.

They show that when antitrust policy is too permissive with acquisitions, there are inefficiencies along those three dimensions. To do so, they consider a model with two types of incumbents: leaders and laggards. They show that leader incumbents have more incentives to acquire a startup than the laggards, as it prevents the laggard from reducing quality differentiation with the leader. Given such acquisition policy, startups prefer to innovate in a direction that improves the technology of leaders, rather than that of laggards. Thus, there are too few innovations that help laggards catch up with leaders, which widens the technological gap and reduces market competition.

Callander and Matouschek (2022) also consider the direction of innovation, but from a horizontal differentiation perspective. A "radical" innovation is an innovation which is different from industry standards, and allows an entrant to soften competition with the incumbent, as it appeals to a different group of consumers. However, developing a radical innovation is riskier and faces a higher chance of failure than developing an innovation which is in line with industry standards.

A new entrant must therefore balance the technological risk of a bold innovation with considerations about market competition. Absent of mergers, entrants choose bold innovations to avoid competition. Allowing mergers, however, pushes entrant to move away from bold innovations and innovate closer to incumbents. This is because it reduces the incumbent's outside option, and leads him to offer more in order to acquire the entrant. Thus, a less strict acquisition policy encourages incremental innovation.

Similarly, Gilbert and Katz (2022) consider a model of innovation and horizontal differentiation. Absent of mergers prospects, entrants choose to differentiate from the incumbent to soften price competition. Merger prospects introduce conflicting incentives: differentiate from the incumbent, so that the merged entity ends up with more control over consumers, or minimize differentiation to reduce the incumbent's outside option, and obtain a higher purchasing price. Unlike Callander and Matouschek, however, Gilbert and Katz offer some policy recommendations, and suggest that the approval of mergers should be subject to the horizontal proximity of the entrant to the incumbent.

Letina, Schmutzler and Seibel (2021) consider a model in which both incumbents and entrants can innovate. They argue that a policy which prohibits the acquisitions of startups is bad for innovation, as it pushes the incumbent to duplicate the research effort of startups and invest in the same projects. As a result, society misses out on more diverse investments in R&D, which lowers the overall probability of innovation. However, as acquisitions reduce product market competition, they argue that policy must find a balance between ex-ante innovation incentives and ex-post competition. In doing so, the distribution of bargaining power plays an important role – blocking a merger being more beneficial when the entrant has low bargaining power.

D. Network effects and the "kill zone"

Many products and services in the tech sector benefit from network effects. Kemepalli, Rajan, and Zingales (2022) argue that in the presence of network effects, a more permissive acquisition policy might in fact discourage innovation, contrary to the invention-for-buyout discussed above. This is due to the existence of a "kill zone."

They consider an incumbent platform and a potential entrant. Customers may not multihome easily, while app designers must pay a cost to adapt their apps to the new platform, for example by having to use a different programming language. As customers and app designers start with the incumbent, the question is whether they would switch to a new entrant.

If, however, it is expected that the new entrant will eventually be acquired by the incumbent, there are very little incentives for either customers or app designers to switch to the new platform. This, in turns, reduces the value of the new platform, which may therefore decide not to innovate and enter in the first place.

V. Conclusion

When considering whether allowing a merger or not, an antitrust authority must usually balance the following two considerations: a merger may reduce product market competition, but may also generate synergies. A merger should be allowed when the benefits of the synergies outweigh the cost of soften competition.

Mergers with startups, however, introduce additional challenges. First, counterfactual analysis is rendered more difficult by the inherent risk and uncertainty surrounding innovation and potential entry of startups. Thus, it may be more difficult for antitrust authorities and firms to come up with an agreement regarding the relevant counterfactuals. Second, the overall stance of the antitrust authority may have an impact on startups' R&D decisions. In particular, being acquired by a large incumbent is often the desired outcome for a small startup, and limiting acquisitions might lead to startups simply not developing their products in the first place.

From an ex-post perspective, we highlighted several factors which should play an important role in an antitrust authority's toolkit, such as dynamics and learning, asymmetric information, the size of private returns to R&D, or bargaining power.

While those considerations may help an antitrust authority form judgment on the merit of an acquisition on a case-by-case basis, the antitrust authority must also take into account the fact that its more general stance on mergers will have an impact on startups' ex-ante incentives to innovate.

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