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# Big Tech Mergers

Massimo Motta*
Martin Peitz**

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*ICREA-Universitat Pompeu Fabra and Barcelona Graduate School of Economics
**University of Mannheim and MaCC

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Massimo Motta† Martin Peitz‡

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**Abstract**

Big tech mergers are frequently occurring events. What are the competitive effects of these mergers? With the help of a simple model we identify the acquisition of potential competitors as a pressing issue for merger control in digital industries. We also sketch a few recent theories of harm of horizontal and conglomerate mergers that are potentially relevant in digital industries. Finally, we draw some policy recommendations on how to deal with mergers in such industries.

**Keywords:** Merger policy, digital markets, potential competition, conglomerate mergers

**JEL Classification:** L41, L13, K21

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†ICREA-Universitat Pompeu Fabra and Barcelona Graduate School of Economics.

‡University of Mannheim and MaCCI.

# 1 Introduction

Big tech mergers happen frequently. Taking a look at the acquisitions by the "Big Five" over the last five years (Amazon, Apple, Facebook, Google, and Microsoft), Amazon is reported to have made 42 acquisitions, Apple 33, Facebook 21, Google (Alphabet) 48 and Microsoft 53.[1] The vast majority of these and earlier mergers were under the radar of Antitrust Authorities (AAs)[2] and the very few that have come under their scrutiny have been approved, among them the prominent mergers of Google/Youtube, Google/Waze, Google/Doubleclick, Facebook/Instagram, Facebook/Whatsapp, Microsoft/Linkedin.[3]

AAs and governments have become increasingly nervous at the perceived concentration in some digital markets and the persistent and increasing market power of some firms operating in digital industries. This has led to a number of recent high-profile reports on digital markets—e.g. ACCC (2019), Crémer et al. (2019), Furman et al. (2019), or Scott Morton et al. (2019)—to better understand their functioning and to formulate possible ways to promote competition.[4] There is also concern that recent mergers were investigated using an inadequate methodology possibly leading to wrong decisions; for instance, in a report commissioned by the UK Competition and Markets Authority (CMA), Argentesi et al. (2019) provide a critical ex-post evaluation of recent UK merger cases in digital industries.

Policy proposals may include a mix of regulatory measures (e.g. obligations for certain firms regarding data portability and interoperability, transparency, as well as not to

[1]Sources: For Amazon: Wikipedia, `https://en.wikipedia.org/wiki/List_of_mergers_and_acquisitions_by_Amazon`; for all other companies: `www.mergr.com`, last accessed December 24, 2019. Other numbers regarding Google and Facebook are reported by Tim Wu and Stuart Thompson, The Roots of Big Tech Run Disturbingly Deep, New York Times, June 7, 2019, `https://www.nytimes.com/interactive/2019/06/07/opinion/google-facebook-mergers-acquisitions-antitrust.html`. Of course, also other firms made several acquisition over the last five years. Taking a look at a few firms that have been around longer, AT&T made 9, Comcast 11, Disney 3, IBM 29, Philips 13, Samsung 13, SAP 11, Siemens 15, and Sony 5 acquisitions in the same period (source: www.mergr.com).

[2]In most jurisdictions, mergers should be notified and can be reviewed by antitrust authorities only if certain turnover thresholds are met. Since in the digital industry firms often start to monetise only when they have developed a very strong customer base, such thresholds may not be met even by companies with very large market value.

[3]As Furman et al. (2019, p. 11) put it, "[o]ver the last 10 years the 5 largest firms have made over 400 acquisitions globally. None has been blocked and very few have had conditions attached to approval, in the UK or elsewhere, or even been scrutinised by competition authorities." It is also noteworthy that the large number of acquisitions is not matched by a large number of divestitures, we have seen very few of the latter by big digital companies (one of the few instances is the spinoff of Paypal by Ebay).

[4]We believe it is not controversial that the combination of economies of scale and scope, network effects, switching costs and behavioural biases is contributing to the persistence of market power by big tech, and make it more difficult for entrants to contest their market positions. For an analysis of barriers to entry in the digital industry, see e.g. Franck and Peitz (2019) and the aforementioned reports.

discriminate), stricter antitrust enforcement, and—relevant for the scope of the present paper—possible changes in merger control. Indeed, some of the (many) mergers in digital industries may well have made the entrenchment of large firms' market positions easier. This applies not only to acquisition of horizontal nature, but also to acquisition of firms which may appear as conglomerate or vertical. Indeed, challenges to an established incumbent may also arise from often small, but quickly growing firms in adjacent markets. The acquisition of potential competitors is therefore a pressing issue for merger control.

In Section 2, which is grounded in Fumagalli, Motta and Tarantino (2020), we develop a simple reduced-form framework to address the possible anti- and pro-competitive effects of the acquisition of *potential* competitors. In our setting, a start-up can develop a project that succeeds with some probability. Whenever the start-up has the ability to pursue its project, the merger will be anti-competitive. The acquisition then becomes either a "killer acquisition" or an upgrade with suppressed competition. The merger can only be pro-competitive if the start-up would not be able to pursue its project absent the merger and if the incumbent will have an incentive to develop the project after acquiring the start-up. We shall also see that the acquisition may also have beneficial ex ante innovation effects: a merger may increase the expected benefit from innovation, and hence stimulate effort to obtain it. In extensions we address conglomerate mergers, the presence of outside investors, and exclusionary conduct by the incumbent.

In Section 3, we look at six recent theories of harm of big tech mergers which remove *actual* competitors.[5] These theories rely on some features that figure prominently in digital industries and that include network effects; two-sidedness and free services to one side; the prominence of big data). They are based on Anderson and Coate (2005) and Anderson and Peitz (2020) in Section 3.1, Nocke and Whinston (2013) in Section 3.2, Prat and Valletti (2019) in Section 3.3, de Cornière and Taylor (2019) in Section 3.4, Rhodes and Zhou (2019) in Section 3.5, and Choi and Jeon (2020) in Section 3.6.

In Section 4, we conclude by making some policy recommendations based on our analysis and some further considerations. This article draws on a number of recent contributions and can be seen as a guide to these works. We give references to them throughout the text.

[5]Of course, there may also be efficiencies. In particular, big tech mergers might incentivise innovation by entrants. While we acknowledge such possible positive effects of mergers on innovation, we did not include them in our analysis. Such a positive effect that counteracts the harm of a merger with exogenous innovation is shown by Katz (2020) in a model in wich firms compete for the market and enjoy some scale economies. For an overview of mergers and innovation more broadly, see Kokkoris and Valletti (2020).

# 2 Acquisition of potential competitors

As pointed out in the Introduction, big tech firms acquired lots of companies, many of them start-ups, over the last five years. In some instances this may boil down to acquiring a potential competitor. To address the competitive effects of such acquisitions we develop a stylised model (a much simplified version of Fumagalli et al., 2020) that provides some guidance as to what to expect from such acquisitions and in which cases they are detrimental to welfare and in which they are not. In our base model, the acquisition takes place in the same market; in Section 2.2 we extend the argument to allow for acquisitions in different markets (which are the stepping stone to invade the big tech's home market). We also add analyses on the presence of outside investors (Section 2.3) and exclusionary conduct by the incumbent (Section 2.4).

## 2.1 A simple model

Consider an industry with an incumbent firm, $I$, and a potential entrant, $E$.[6] The latter has a project (or a blueprint, or an idea for a new software application, or a prototype) which, if successfully developed, can become a substitute of the incumbent's product or service. The project development will cost $K$, and the success probability of the project is $p$.[7] A merger is an acquisition of a *potential* competitor if it takes place before the entrant has actually decided to develop the project. The entrant can be seen as a start-up with a promising idea (possibly a beta version launched for a particular test audience) which requires resources before knowing whether the product or service can actually succeed in the market.

A necessary condition for the project to be successful is that the developer has resources $R_E$—this can be data, expertise in terms of human capital or marketing skills, financial assets, or some other input—that exceed some threshold $\overline{R}$. We assume that the entrant can go ahead with the project only if $R_E \geq \overline{R}$. The potential entrant may or not have enough resources, and this will turn out to be crucial for the effects of the acquisition. In what follows, we assume that $R_E$ can be perfectly observed (we discuss later the case where the incumbent lacks information on $R_E$), and that it is exogenous (in an extension, we discuss the case where it is endogenous). We also assume that the incumbent has enough resources ($R_I > \overline{R}$), so it would always have the *ability* to develop,

[6] The industry may contain further firms. For simplicity, we focus our analysis on a single potential acquirer and a single acquisition target.

[7] For simplicity, we assume that $p$ is exogenous and does not depend on the identity of the firm. Of course there may be particular reasons why an incumbent could have a lower or higher success probability than an entrant, but assuming the same probability for both seems a good benchmark.

but—as we shall see below—it may not have the *incentive* to do so, if it bought $E$.

**Payoffs** If $E$ remains independent, has enough resources, and successfully develops the project, it will make duopoly profits $\pi_E^d$ and the incumbent will make $\pi_I^d$. If $I$ takes over $E$ and successfully develops the project, it will be a monopolist with two products (or services, or applications) and will earn $\pi_I^M$.[8] If the project is shelved, or is not successfully developed, the incumbent will remain a single-product monopolist and will earn $\pi_I^m$.

We assume that $p\pi_E^d - K \geq 0$, or:

$$\pi_E^d \geq \frac{K}{p}, \tag{A1}$$

which ensures that an entrant with sufficient resources will want to develop the project. For the time being, we shall also assume that:

$$\pi_E^d + \pi_I^d < \pi_I^M < \pi_E^d + \pi_I^m. \tag{A2}$$

The LHS inequality of (A2) amounts to saying that industry profits are higher under a monopoly than a duopoly, and the RHS inequality corresponds to the condition under which the Arrow replacement effect holds, namely that—because of cannibalisation effects—an entrant would have greater incentives to invest than a monopolist.[9]

Finally, we assume that the consumer surplus ranking across configurations is as follows: it is the highest under competition, followed by the case of monopoly with two products, and by that of a single-profit monopoly: $CS^d > CS^M > CS^m$. We shall assess mergers according to their effects on consumers here, because this is the standard that is used by antitrust authorities around the world. However, our conclusions would not change if we used a total welfare standard instead.[10]

**The game** Consider the following game.

- At time $t = 1$, $I$ makes a takeover offer to $E$, which can accept or reject.
- At time $t = 2$, the firm that owns the project decides whether to develop it or not.

[8] We do not impose a particular structure on the duopoly interaction. We implicitly assume that the duopoly equilibrium exists and is unique. We also make assumptions on some properties of equilibrium profits compared to monopoly outcomes below. An extension to an oligopoly with more than two firms is straightforward.

[9] The entrant's incentive to invest is given by $p\pi_E^d \geq K$, the incumbent's by $p\pi_I^M + (1-p)\pi_I^m - K \geq \pi_I^m$, which can be rewritten as $p(\pi_I^M - \pi_I^m) \geq K$. The former is larger than the latter when the RHS of (A2) holds.

[10] Indeed, Fumagalli et al. (2020) use a total welfare standard.

- At time $t = 3$, active firms sell in the product market, and payoffs are realised.

We look for sub-game perfect Nash equilibria and, as usual, solve the game by backward induction.

### 2.1.1 Benchmark: no merger is allowed

It is convenient to see first what happens if mergers were prohibited. This also coincides with the continuation of the game which follows a rejection of the offer by the entrant.[11] It is straightforward that:

**Lemma 1.** *At the benchmark without takeovers, the equilibrium is given by:*

- *If $R_E < \overline{R}$, the entrant will not be able to develop the project. At equilibrium, only the incumbent will be active: it will make a profit equal to $\pi_I^m$, and expected consumer surplus will be $CS^m$.*
- *If $R_E \geq \overline{R}$, then the entrant will develop the project. Its expected profits and the incumbent's are, respectively, $p\pi_E^d - K$ and $p\pi_I^d + (1-p)\pi_I^m$. Expected consumer surplus is $pCS^d + (1-p)CS^m$, which is larger than $CS^m$.*

### 2.1.2 Solution of the takeover game

We turn to the solution of the whole game. Let us move backwards, and look at the sub-games starting from $t = 2$. First, suppose that $E$ was acquired by $I$ at $t = 1$. In this case, $I$ will own the project, and will develop it if and only if $p\pi_I^M + (1-p)\pi_I^m - K \geq \pi_I^m$, which can be rewritten as:

$$\pi_I^M - \pi_I^m \geq \frac{K}{p}. \tag{1}$$

Note that $\pi_I^M - \pi_I^m < \pi_E^d$ by A2. Therefore, if (1) holds, both the incumbent and a sufficiently endowed entrant would develop the project, whereas if (1) is violated, only the latter would develop it. This is the main force behind the so-called "killer acquisitions" and it consists of the well-known Arrow replacement effect, whereby an incumbent has less incentive to develop an innovation because it would cannibalise (part of) its current profits.

Next, suppose that no merger took place at $t = 1$. In this case, the continuation equilibrium is given by lemma 1.

[11] As we shall show below, though, the takeover will always occur at equilibrium.

Let us now move to the first stage of the game. If $R_E < \overline{R}$, then $E$'s expected profits are $V_E = 0$, which is also $E$'s reservation price for selling out. Whether it will develop or not, the incumbent (which, by assumption, has the bargaining power in the takeover negotiation) will offer 0 and acquire $E$.[12]

If instead $R_E \geq \overline{R}$, then absent the takeover $E$ would invest, and have expected profits $V_E = p\pi_E^d - K \geq 0$, which corresponds to its reservation value in the takeover negotiation. We then have two cases.

(i) If $\pi_I^M - \pi_I^m \geq \frac{K}{p}$, the incumbent's willingness to bid for the takeover is given by:

$$V_I = p\pi_I^M + (1-p)\pi_I^m - K - [p\pi_I^d + (1-p)\pi_I^m] = p(\pi_I^M - \pi_I^d) - K. \tag{2}$$

For the takeover to take place, it must be $V_I \geq V_E$, or: $p(\pi_I^M - \pi_I^d) - K \geq p\pi_E^d - K$, which is always satisfied under assumption (A2).

(ii) If instead $\pi_I^M - \pi_I^m < \frac{K}{p}$, the incumbent will not invest after the takeover, and its willingness to bid for the takeover is given by:

$$V_I' = \pi_I^m - [p\pi_I^d + (1-p)\pi_I^m] = p(\pi_I^m - \pi_I^d). \tag{3}$$

For the takeover to take place, it must be $V_I' \geq V_E$, or: $p(\pi_I^m - \pi_I^d) \geq p\pi_E^d - K$. Note that under (ii) we can write $\pi_I^m + K/p > \pi_I^M > \pi_I^d + \pi_E^d$, which is again satisfied: the takeover will take place.

Note that the takeover will always occur at equilibrium because the incumbent has a strong incentive to protect its monopoly profits (Gilbert and Newbery, 1982).

**Lemma 2.** *At equilibrium, the takeover will always take place, and:*

- *If $\pi_I^M - \pi_I^m < \frac{K}{p}$, the incumbent will not develop the project. Only the incumbent will be active: it will make a profit equal to $\pi_I^m$, and expected consumer surplus will be $CS^m$.*
- *If $\pi_I^M - \pi_I^m \geq \frac{K}{p}$, then the incumbent will develop the project after the takeover. Its expected profits will be $p\pi_I^M + (1-p)\pi_I^m - K$. Expected consumer surplus is $pCS^M + (1-p)CS^m$.*

[12] If it develops the project (i.e., if $\pi_I^M - \pi_I^m \geq \frac{K}{p}$), the incumbent's gain from the acquisition is positive (it will be given by $p\pi_I^M + (1-p)\pi_I^m - K - \pi_I^m$). Otherwise it will be zero. If the acquisition entailed some arbitrarily small but positive transaction cost, in the latter case the acquisition would not take place, but for simplicity we abstract from such a cost.

### 2.1.3 The effects of the acquisition

We can now build on the analysis carried out so far and look at the effects of an acquisition relative to the (crude) benchmark where the incumbent cannot acquire the potential competitor.

**Proposition 1.** *Relative to the benchmark where the takeover is prohibited, the acquisition of the potential competitor would:*

- *(i.a) (dead project) If* $\pi_I^M - \pi_I^m < \frac{K}{p}$ *and* $R_E < \overline{R}$*, the acquisition will be competitively neutral: regardless of whether an acquisition takes place or not, the project will not be developed, and consumer surplus will always be* $CS^m$*.*

- *(i.b) (killer acquisition) If* $\pi_I^M - \pi_I^m < \frac{K}{p}$ *and* $R_E \geq \overline{R}$*, the acquisition will be anti-competitive: absent a takeover, E will develop the project and if successful compete with the incumbent, whereas following the takeover the project will be shelved and competition suppressed. The acquisition will lower consumer surplus from* $pCS^d + (1-p)CS^m$ *to* $CS^m$*.*

- *(ii.a) (efficient upgrade) If* $\pi_I^M - \pi_I^m \geq \frac{K}{p}$*, and* $R_E < \overline{R}$*, the acquisition will be efficient: absent a takeover, E will not invest in the project, whereas a takeover will allow development of the project. Hence, the acquisition will increase consumer surplus from* $CS^m$ *to* $pCS^M + (1-p)CS^m$*.*

- *(ii.b) (upgrade with suppressed competition) If* $\pi_I^M - \pi_I^m \geq \frac{K}{p}$ *and* $R_E \geq \overline{R}$*, the acquisition will be anti-competitive: absent a takeover, E will develop the project and if successful compete with the incumbent, whereas following a takeover the incumbent will invest in the project, but will suppress competition. The acquisition will hence lower consumer surplus from* $pCS^d + (1-p)CS^m$ *to* $pCS^M + (1-p)CS^m$*.*

### 2.1.4 Discussion of Proposition 1

Within our simple model one can see that acquisitions of start-ups which may become potential competitors a priori may be pro- or anti-competitive, so that simplistic policies—say, continue with the laissez-faire approach that de facto antitrust agencies have adopted, or at the opposite extreme the prohibition of all takeovers by big tech—would not be warranted.

We will provide a more thorough policy discussion later on, but Proposition 1 already gives us some useful hints. In particular, our analysis reveals that to understand the

Table 1: Equilibria of the base model

| | $R_E < \overline{R}$ | $R_E \geq \overline{R}$ |
|---|---|---|
| $(\pi_I^M - \pi_I^m < K/p)$ | (i.a) dead project | (i.b) killer acquisition |
| $(\pi_I^M - \pi_I^m \geq K/p)$ | (ii.a) efficient upgrade | (ii.b) upgrade, but suppressed competition |

likely effects of any given acquisition, it is crucial to identify the likely counterfactual to that acquisition. Indeed, it is straightforward that whenever the start-up has the ability to pursue its project, the merger will be anti-competitive. (In terms of Table 1, whenever $R_E \geq \overline{R}$, the acquisition will lower consumer surplus.) In other words, it will be inevitable for AAs to ask what would happen if the merger was prohibited: Would the target firm be able to invest and have the chances to develop the project? (We shall also come back to this question in Section 2.3 below, when considering an extension where the incumbent may face outsiders bidding for the target.)

Unlike what has happened over the last decade, where AAs have developed simple quantitative tools (such as GUPPI, IPR and the like), it looks like that a richer qualitative and, if possible, quantitative analysis would be necessary, investigating—through the analysis of internal documents, business plans, financial analyses—the likely scenarios for the target should the merger not go ahead.

Another preliminary observation is that a merger may be pro-competitive (and hence the AA and the Courts may make a mistake if prohibiting it) if and only if two conditions are satisfied: first, the takeover target would not be able to pursue its project absent the merger; second, the incumbent will have an incentive to pursue, rather than shelve, the project. Like the first condition, also the second condition may not be easily checked, but presumably the acquiring company may be able to convince the AAs that—should the merger go ahead—it would really have an incentive to continue the project, for instance because it would not lead to a close substitute but rather to a significant upgrade of its core offering.[13]

[13]We recall that we take the probability of success of the project to be independent of who owns the project. It is of course conceivable that a project is more likely to be successful if it was in the hands of the (more experienced) incumbent, and this would result in another type of efficiency gain of the takeover. But it is also conceivable that the probability of success of the project is higher when the

Before discussing policies more thoroughly, we extend the basic model in several directions.

### 2.1.5 Extensions

In this subsection, we modify the base model with respect to profit ordering, the number of insiders, the information about $R_E$, and the availability of the start-up's project.

**Alternative profit ordering** The assumption that duopoly profits are smaller than monopoly profits (see LHS inequality of assumption A2) is innocuous in the sense that should it not hold, quite simply the takeover would not take place.[14]

Less innocuous is the "Arrow Replacement effect" assumption (RHS inequality of assumption A2): if it did not hold, there may exist projects that an entrant would not carry out, while an incumbent would—namely, the reverse of what we find here. We are not aware of theoretical results which characterise the circumstances under which this condition holds in general (or does not). In several standard oligopoly models, it holds (for instance, one can show that it holds for general demand functions with homogenous goods and cost-reducing innovation, and for simple differentiated goods models with linear demand, e.g. Shubik-Levitan functions), but it might not hold for general quality-enhancing innovations (see e.g., Greenstein and Ramey, 1998). Empirically, the best available evidence is provided by Cunningham et al. (2018), who study the development of pharmaceutical projects[15] and find that when incumbents acquire firms which have been developing competing drugs, they are less likely to develop such drug projects (and that the incentive to abandon such projects increases with the incumbent's market power). Such results may be interpreted as providing some support for the "Arrow replacement effect" assumption.

**Competition with differentiated products and several incumbents** Cunningham et al. (2018) develop a similar theoretical framework (in terms of our model, they

entrant remains independent (for example, because the entrepreneur has higher personal motivation or because the project is unobstructed by the incumbent's bureaucratic organisation), in which case there would be a further reason for the takeover to be anti-competitive, in case the entrant has sufficient resources available.

[14]In the extension where other "big tech" outside of the industry may also bid for the start-up, if the equivalent assumption did not hold, an outsider rather than the incumbent would purchase the start-up, and anti-competitive effects due to suppression of competition and/or shelving of the project could be ruled out.

[15]Regulation provides this sector with a unique framework where the life of new drug projects is clearly structured and can be observed during the several identifiable steps which may eventually lead to commercialisation of a new drug.

restrict attention to the case in which $E$ has sufficient resources, which in turn implies the merger is anti-competitive), but consider $n \geq 1$ (symmetric) incumbent firms and assume a specific demand function for differentiated products. Their model shows that more competition among incumbents makes it less likely that killing acquisitions would take place. This yields a testable prediction that turns out to be supported by their empirical evidence.

**Asymmetric information on the start-up's resources** Our base model above is a bare-bones version of Fumagalli et al. (2020). In that paper, the resources required for the project are financial resources.[16] They introduce asymmetric information in the model, allow the takeover to possibly take place both before and after the entrant's financial contracting, and analyse the ex ante effects of mergers.

The incumbent does not know the financial assets possessed by the target firm, and hence its likelihood to obtain funding for the project. Due to asymmetric information, there may be pooling or separating equilibria: in the former (which arises when the incumbent expects the start-up's likelihood to receive funding to be sufficiently large) the incumbent will offer a high takeover price and any start-up would accept; in the latter (which emerges instead when the incumbent expects the start-up's likelihood to receive funding to be sufficiently small), the incumbent would offer a low price, and only a start-up whose funding abilities are low will accept it, whereas otherwise the start-up will reject the takeover bid and pursue its project.[17]

The following insights are obtained: (1) acquisitions are more likely to be anti-competitive in *less* imperfect financial markets (because in these markets it is more likely that the target firm would invest in the counterfactual to the merger); (2) a policy which prohibits the incumbent from taking over an entrant *which has already successfully developed the new product*—and therefore is about to enter the market—is not necessarily optimal, because outside investors anticipate that the entrant may be taken over by the incumbent, and hence expect their loan to have a higher probability to be repaid (as $I$, after the acquisition, will have to assume the loan obligations of the start-up, and has higher expected profits than the latter); (3) the existence of uncertainty may lead the incumbent to take over targets which otherwise would not expect to "get to the market" (in the pooling equilibria mentioned above), and this in turn raises the ex ante incentives to "create" the project—this happens in an extended game where there is a $t = 0$ stage

[16] They model the contracting game where the entrant resorts to the financial market, and hence they endogenise the equivalent of our threshold $\overline{R}$ above.

[17] If takeovers are allowed after the project is realised, the incumbent would want to take over a successful start-up later on, just before it starts marketing its substitute product.

at which the entrepreneur exerts effort to create the "project", which we discuss next.

**The start-up's ex ante incentives to innovate** So far, the existence of the start-up's project was always exogenously given. However, it is conceivable that the project is itself the outcome of a previous "ex ante" decision, which may well be influenced by expectations about what would happen in the continuation game. Here, we endogenise the probability that the start-up's project comes into existence: the entrepreneur's expected profits is a positive function of its effort.

To account for the ex ante incentives to innovate, consider our base model and extend it so as to have a pre-stage where the start-up's owner decides the level of effort $e$ she makes to innovate. This effort will positively affect the probability the innovation will be successful and will become the "project". For simplicity, assume that the level of effort is exactly equal to the probability of "discovery" of the project. The cost of effort $c(e)$ is increasing and convex in $e$, and is such that at equilibrium $e \in [0, 1]$. Expected profits from effort will be $\Pi(e) = e\pi_e - c(e)$, where $\pi_e$ is the start-up's expected payoff in the continuation equilibrium of the game, and will consist of the takeover price it obtains (we know at equilibrium it will decide to sell out).[18] Equilibrium effort is then given by $e^* = \arg\max_e\{e\pi_e - c(e)\}$, which is increasing in $\pi_e$: on the basis of this simple formalisation, whatever raises the expected continuation payoff of a project will raise the probability that a project exists in the first place.

The introduction of this innovation effort stage of the game will allow us to deal with the ex ante effects of mergers. In particular, many commentators argue that takeovers by big tech are pro-competitive because they stimulate innovations, and we shall come back to this issue at the end of Section 2.3, as well as when drawing policy conclusions.

In the following sections, we extend the model in three further directions. In Section 2.2 we show that our model can be reinterpreted to consider "conglomerate" mergers, according to which the entrant is active in an independent market but that from there it could invade the incumbent's market with some positive probability. In Section 2.3 we consider the case where there is an outsider who also competes for the start-up. Finally, in Section 2.4 we endogenise the resources of the start-up.

[18] Fumagalli et al. (2020) and, before them Nörback and Persson (2009), use this formalisation. Note that the outcome of this stage, which consists of a probability $e^*$, does not affect the rest of the game. If eventually the project materialises, the game will continue exactly as before. If not, quite simply it will not be played.

## 2.2 Conglomerate mergers

It is often argued that that risks for incumbents may come from a firm active in another (complementary or independent) market, which may build on success on such a market (in terms of customer base, data, technology) to subsequently enter the incumbent's core market. For example, placing the offerings of Facebook and Instagram prior to Facebook's takeover in separate markets, Instagram may have become a serious threat to Facebook as a social network (see, e.g., Argentesi et al., 2019).

Our simple model can be easily extended to account for such a possibility. Consider an environment in which our incumbent firm, $I$, is active in market 1, and the potential entrant, $E$, has a project in another market, 2. If successfully developed, the project gives $E$ a monopoly position in market 2, but might also give it, with some probability $q$, the ability to launch a new product which would challenge the incumbent on the latter's turf, i.e. market 1. (Note that if $I$ acquires $E$, this may be seen as a "conglomerate merger", since $E$'s is ostensibly operating in unrelated market 2.)

As before, the project development will cost $K$, and the probability of success is $p$, and $E$ needs to have at least resources $\overline{R}$) to develop the project. The model will be the same as in the previous section, after reinterpreting the payoffs as follows. If $E$ remains independent, has enough resources, and successfully develops the project, it will make expected profits $\pi_E^d = \pi_E^2 + q\pi_E^{1d}$ and the incumbent will make in expectations $\pi_I^d = (1-q)\pi_I^{1m} + q\pi_I^{1d}$. If $I$ takes over $E$ and successfully develops the project, it will be a monopolist with two products in market 1 and one in market 2, and its expected profits will be $\pi_I^M = \pi_I^{1m} + \pi_E^2 + q(\pi_I^{1M} - \pi_I^{1m})$. If the project is shelved, or is not successfully developed, the incumbent will remain a single-product monopolist and will earn $\pi_I^m = \pi_I^{1m}$.

Note that the assumption that an entrant with sufficient resources will want to develop the project can be rewritten as $\pi_E^d = \pi_E^2 + q\pi_E^{1d} \geq \frac{K}{p}$.

Further, assumption (A2) becomes, after using the above definitions and simplifying:

$$\pi_E^{1d} + \pi_I^{1d} < \pi_I^{1M} < \pi_E^{1d} + \pi_I^{1m}, \tag{4}$$

meaning that the original inequalities in market 1 payoffs given by (A2) suffice for the present extension.

Once re-interpreted this way, all the results obtained in the base model follow through. First, it is immediate to check that if it acquires $E$, the incumbent will want to invest if and only if:

$$p[\pi_I^{1m} + \pi_E^2 + q(\pi_I^{1M} - \pi_I^{1m})] + (1-p)\pi_I^{1m} - K \geq \pi_I^{1m}, \tag{5}$$

which simplifies to:

$$\pi_E^2 + q(\pi_I^{1M} - \pi_I^{1m}) \geq \frac{K}{p}. \tag{6}$$

Next, we can restate Lemma 2, as the following remark:

**Remark 1.** *At equilibrium, the "conglomerate" takeover will always take place, and:*

- *If* $\pi_E^2 + q(\pi_I^{1M} - \pi_I^{1m}) < \frac{K}{p}$*, the incumbent will not develop the project.*
- *If* $\pi_E^2 + q(\pi_I^{1M} - \pi_I^{1m}) \geq \frac{K}{p}$*, then the incumbent will develop the project after the takeover.*

*Proof.* $E$'s expected value at $t = 1$, absent the takeover, will be given by:

$$V_E = p(\pi_E^2 + q\pi_E^{1d}) - K. \tag{7}$$

To find the incumbent's valuation for the purchase of firm $E$, consider two cases. First, suppose that (6) holds. In this case, $I$'s willingness to pay for $E$ will be:

$$V_I = \pi_I^{1m} + p[\pi_E^2 + q(\pi_I^{1M} - \pi_I^{1m})] - K - [\pi_I^{1m} - pq(\pi_I^{1m} - \pi_I^{1d})] = p[\pi_E^2 + q(\pi_I^{1M} - \pi_I^{1d})] - K. \tag{8}$$

It is immediate to see that $V_I \geq V_E$ amounts to $\pi_I^{1M} \geq \pi_I^{1d} + \pi_E^{1d}$, which holds by assumption.

Next, suppose that (6) does not hold, which implies that we are in the following case:

$$p\pi_E^2 - K + pq\pi_I^{1M} < pq\pi_I^{1m}. \tag{9}$$

In this case, $I$'s willingness to pay for $E$ will be:

$$V_I' = \pi_I^{1m} - [\pi_I^{1m} - pq(\pi_I^{1m} - \pi_I^{1d})] = pq(\pi_I^{1m} - \pi_I^{1d}). \tag{10}$$

The takeover will take place as long as $V_I' \geq V_E$, which after simplifying becomes:

$$p\pi_E^2 - K + pq(\pi_I^{1d} + \pi_E^{1d}) < pq\pi_I^{1m}, \tag{11}$$

which is always satisfied when condition (9). Indeed, recall that $\pi_I^{1M} \geq \pi_I^{1d} + \pi_E^{1d}$; hence, it must be $p\pi_E^2 - K + pq(\pi_I^{1d} + \pi_E^{1d}) < p\pi_E^2 - K + pq\pi_I^{1M} < pq\pi_I^{1m}$. □

To summarise, this model shows an incumbent may want to acquire a start-up whose complement product to the incumbent may become a substitute to it. It may therefore

provide a rationalisation of Crémer et al. (2019, p. 116), who argue that "[c]ompetitive threats will typically come from the fringe ... Buying up promising start-ups that offer fringe products or services may therefore result in early elimination of potential competitive threats—which may be particularly problematic if done systematically."

Several other commentators have identified in the risk of dis-intermediation a frequent reason why incumbents may want to remove successful start-ups. (An incumbent typically enjoys a bottleneck position which obliges users of complementary services to access the platform under the control of the incumbent firm to be able to use them. The incumbent firm may then fear dis-intermediation, which occurs whenever the other firm offering complementary services manages to bypass the platform.)[19]

## 2.3 Mergers in the presence of outside investors

For the purpose of exploring possible policies towards acquisitions of start-ups, consider now an extension of our base model above where at $t = 1$ there is an outsider $O$ which is also interested in taking over $E$ (see also Fumagalli et al., 2020). Assume that $O$ is sufficiently endowed with the necessary resources/data for the project to be carried out, that is, $R_O \geq \overline{R}$, and that if successful in project development, it will obtain market profits $\pi_O^d \geq \pi_E^d$.[20]

Under the assumption that monopoly profits are higher than the sum of duopoly profits, which can be rewritten here as $\pi_O^d + \pi_I^d < \pi_I^M$, one can check that at equilibrium the incumbent will always win the bidding competition for the takeover, and will have to pay $E$ the takeover price $p\pi_O^d - K \geq p\pi_E^d - K$.[21]

The model extension with an outsider which could also bid for $E$ gives us another natural benchmark to judge the effect of the acquisition by the incumbent, namely a policy whereby not all acquisitions are prohibited (as in the base model), but just the acquisition by the incumbent (i.e. by the firm whose dominant position is threatened by the project).

Such a policy would eliminate any anticompetitive effects: the outsider $O$ would always have both the ability (by assumption) and the incentive to invest, and if successful

[19] In the *United States v. Microsoft Corp.* 2001 antitrust case, to cite an older example, the US Department of Justice argued that Microsoft was worried that Netscape would support a development which could by-pass Windows. This is also a reminder that an incumbent might also prevent dis-intermediation by foreclosing a rival rather than acquiring it, as also discussed by Scott Morton et al. (2019, pp. 72-73). See Section 2.4 below.

[20] In principle, if $O$ makes higher duopoly profits than $E$, namely $\pi_O^d \geq \pi_E^d$, one would also expect that $\pi_I^d$ is lower when competing with $O$ than when competing with $E$. However, for simplicity let us not make $\pi_I^d$ contingent on the nature of the incumbent's rival.

[21] We continue to assume that it is the buyers which make takeover offers to the start-up.

it will always bring competition to the market.

In practice, such a policy would imply identifying the likely trajectory of the possible target company, and prohibiting the acquisition by an incumbent whose core products may possibly be along such a trajectory (unless there are substantial efficiencies from the merger that more than offset the expected harm to competition—see our concluding section). Although in some cases such an exercise may be difficult (unlike pharmaceutical products, in digital industries development trajectories may be surprising), in others such an identification may be relatively straightforward.[22] For instance, in case of Instagram and Whatsapp, there was little doubt that they might have (some would say they had already) developed into competitors of Facebook in the social network apps market. And in the case of Waze, it was clear that it was already active in turn-by-turn navigation apps, and as such it was already competing with Google Maps (and perhaps it might have expanded to compete more generally with Google Maps).

Based on our model, it is also worth noting that a laissez-faire approach with respect to a takeover "war" between the insider and outsiders would be unlikely to deliver a good outcome: the incumbent would be more likely to win, pushed by the objective of protecting its incumbency profits.[23] An example of this may come from the Google/Waze merger. Press articles reported that both Apple and Facebook had shown interest in purchasing Waze. But, in our view unsurprisingly in the light of the discussion above, Google was willing to pay more and eventually secured the purchase of Waze.[24]

A few caveats on the policy of prohibiting incumbents from taking over firms whose trajectory may lead them to enter the incumbent's core business may be at issue, though. (1) There may exist cases where no outsider is likely to have an interest in taking over $E$. Or (2) such an outsider may exist but might not be endowed with sufficient resources to guarantee that the start-up's project will be developed. These are all possibilities that an AA should assess on the facts of the case. Note, though, that unless the incumbent would be able to show that it has the ability and above all the incentive to develop the project in case of takeover, a priori there would be no reason to prefer the incumbent to the outsiders. (We shall come back to the questions of burden and standard of proof in merger control in the conclusion.) (3) As Fumagalli et al. (2020) note, a policy prohibiting the incumbent from taking over a potential competitor may have some adverse ex ante effects. Indeed, note that if the incumbent cannot bid for $E$, then the takeover price

[22]For a contrasting view, see Cabral (2019).

[23]Recall that in our simple model, this is reflected in the condition that monopoly profits are higher than the sum of duopoly profits.

[24]Evaluating the likely consumer welfare effects of these alternative mergers is complex and we do not take a stance on which one whould have been best for consumers.

received by $E$ will fall from $\pi_O^d$ (the price paid by $I$ when competing with $O$ in the takeover) to $\pi_E^d$ or 0 (when $O$ can takeover $E$ by simply offering it the outside value). This may have an ex ante effect, if—as posited in the previous section—equilibrium effort $e^*$ is a nondecreasing function of the expected payoff of the innovator, $\pi_e$.

## 2.4 Endogenising the resources of the start-up: Exclusionary conduct by the incumbent (and the "kill zone" argument)

We have so far assumed that the "resources" needed by the entrant to pursue its project are exogenously given. In this section, we propose a simple reduced-form model which endogenises them by making them depend on market outcomes which take place before the acquisition offer is made. More concretely, we return to the base model and extend the game studied there by adding a product market interaction at a time $t = 0$, and by allowing the incumbent to take a strategic decision which may affect such an interaction.

In this way, we intend to capture, within a stylised model, the idea that an incumbent may engage in exclusionary practices aimed at preventing an entrant from challenging its core market. Such practices may be refusal to supply, degradation of interoperability, tying or bundling, or imitation of the entrant's products.[25] They may be costly for the incumbent in the short-run, but—to the extent that they will reduce the ability of the entrant to contest its dominant position in the core market—they may turn out to be profitable in the long-run. Our treatment below can be seen as the reduced-form of more elaborated and better formalised models, such as Carlton and Waldman (2002) on tying, Fumagalli and Motta (2019a, 2019b) respectively on tying and vertical foreclosure (refusal to supply but also other exclusionary practices including exclusive dealing and predation), and—the closest paper in spirit to our treatment here—Motta and Shelegia (2020) on denial of interoperability and imitation. In all these papers, an incumbent has a "dynamic" incentive to exclude, in the sense that it engages in a practice aimed at excluding or marginalising a rival (by decreasing its scale, customer base, or profits) to protect or enhance *future* profits, in settings where the market today is different from the market tomorrow. The extension below shares the same feature.

**The extended game** Suppose that when the game starts, the entrant is active in a certain market, which may be the same as the core market of the incumbent, or an adjacent market, or an independent one. At $t = 0(i)$, firm $I$ decides whether it wants

[25]Note that while the first three practices may result in an abuse of dominance conduct and sanctioned by competition law, for imitation to be unlawful it would be necessary to go beyond competition law, and find an infringement of Intellectual Property Rights laws.

to engage in some exclusionary practice (call it the "fighting" strategy) or "accommodate". If the former, the incumbent reduces the visibility, sales and/or profits—that we describe with the generic term "resources"—that the entrant obtains in the market at time $t = 0(ii)$; if the latter, the entrant will instead have higher "resources". We indicate these realisations respectively by $R_E^L$ and $R_E^H$, where $L$ stands for "low", $H$ stands for "high", and $R_E^L < \overline{R} \leq R_E^H$. However, fighting may be costly for the incumbent, so that the incumbent's profit realisation at $t = 0(ii)$ will be lower when fighting than when accommodating: $\pi_I^f = \underline{\pi}_I \leq \pi_I^a = \overline{\pi}_I$. The rest of the game is unchanged. In particular, the resources obtained at $t = 0(ii)$ and available to $E$ at $t = 1$ will determine its ability to pursue a project which—if successful—would create competition in the incumbent's core market (with the same $t = 3$ payoffs as in the base model). Finally, we discount profits at $t = 3$ (that is, the second market realisation) at a factor $\delta \leq 1$.[26] Summarising, the game is as follows:

- At $t = 0(i)$ the incumbent decides whether to fight or accommodate.
- At $t = 0(ii)$, $I$ and $E$ obtain period $t = 0$ profits in their markets
- At $t = 1$, $I$ makes a takeover offer to $E$, which can accept or reject.
- At $t = 2$, the firm that owns the project decides whether to develop it or not.
- At $t = 3$, active firms sell in the product market, and payoffs are realised.

**The model, if no acquisitions are possible** To understand the simple logic of the model, it is convenient to look first at the case where mergers cannot take place. If the incumbent accommodates, the entrant will have enough resources to pursue its project ($R_E^H > \overline{R}$), and expected $t = 3$ market profits for $I$ and $E$ will be respectively $p\pi_I^d + (1-p)p\pi_I^m$ and $p\pi_E^d - K$. If instead the incumbent fights, then the entrant will not have enough resources to develop ($R_E^L < \overline{R}$) and $t = 3$ profits will be respectively $\pi_I^m$ and 0. Anticipating this, the equilibrium is characterised as follows:

**Remark 2.** *If the incumbent can take a strategic decision affecting $E$'s resources at $t = 0$, but acquisitions are prohibited:*

- *If $\delta p(\pi_I^m - \pi_I^d) \geq \overline{\pi}_I - \underline{\pi}_I$, the incumbent will "fight", profits will be $\pi_I^m$ and 0, and no project will be developed.*

[26] Note that $\delta$ may also be interpreted as the weight of the future market realisation relative to the current one. It could also be larger than 1, in this case.

- *If* $\delta p(\pi_I^m - \pi_I^d) < \overline{\pi}_I - \underline{\pi}_I$*, the incumbent will "accommodate", the entrant will invest in its project and profits will be respectively* $p\pi_I^d + (1-p)p\pi_I^m$ *and* $p\pi_E^d - K$*.*

*Proof.* By accommodating, the total profits of the incumbent will be $V_I^a = \overline{\pi}_I + \delta[p\pi_I^d + (1-p)p\pi_I^m]$. By fighting, they will be: $V_I^f = \underline{\pi}_I + \delta\pi_I^m$. It is immediate that $V_I^f \geq V_I^a$ iff $\delta[p(\pi_I^m - \pi_I^d)] \geq \overline{\pi}_I - \underline{\pi}_I$. □

The intuition behind Remark 2 is straightforward. The incumbent faces a trade-off between short-run losses from behaving aggressively, equal to $\overline{\pi}_I - \underline{\pi}_I$, and long-term gains from exclusion, equal to $\delta[p(\pi_I^m - \pi_I^d)]$. In particular, the higher the weight of the future market realisation, $\delta$, the higher the chance the entrant could come up with a substitute, $p$, and the greater the foregone profits from future competition, $\pi_I^m - \pi_I^d$, the stronger the incentive to engage in exclusionary practices.

Note also that not all the exclusionary practices may be equally costly. For instance, Motta and Shelegia (2020) show that imitation may actually *increase* the short-run profits of the incumbent: in their model, the entrant is initially active in a market which is complementary to the primary product of the incumbent, and by copying $E$'s complementary product, which reduces its price and expands its sales, the profits made by the incumbent on its primary product would actually increase in the short-run (unless the cost of imitation are too high), while the entrant's sales and profits would fall. But practices such as tying, predation, and vertical exclusion would typically harm both the rival and the incumbent.

**Solution, when acquisitions are possible** Let us now solve the whole game, for the case where acquisitions are possible. Given the incumbent's strategies at $t = 0$, we already know that at the continuation equilibria the takeover will always take place, and that the payoffs will also depend on whether the incumbent has or not an incentive to develop, as summarised by Table 2.

In particular, note that if the incumbent fights, $E$ would not have enough resources to develop, and as a result $I$ will be able to acquire $E$ at zero price; instead, if the incumbent accommodates, absent the takeover $E$ would be able to develop and hence the incumbent will have to make a bid equal to $p\pi_E^d - K$.

We can now see what happens at stage $t = 0$ of the game.

**Remark 3.** *If the incumbent can take a strategic decision affecting* $E$*'s resources at* $t = 0$*, and acquiring it at* $t = 1$*:*

- *If* $\delta[p\pi_E^d - K] \geq \overline{\pi}_I - \underline{\pi}_I$*, the incumbent will "fight", it will take over* $E$ *at* $t = 1$ *by paying* 0*, and will invest in the project iff* $\pi_I^M - \pi_I^m \geq K/p$*.*

Table 2: Payoffs, as function of the incumbent's strategies and incentives to invest

| | $I$ **fights** $\rightarrow R_E^L < \overline{R}$ | $I$ **accommodates**$\rightarrow R_E^L > \overline{R}$ |
|---|---|---|
| $I$ **develops** | $p\pi_I^M + (1-p)\pi_I^m - K$ | $p\pi_I^M + (1-p)\pi_I^m - p\pi_E^d$ |
| $(\pi_I^M - \pi_I^m \geq K/p)$ | 0 | $p\pi_E^d - K$ |
| $I$ **shelves** | $\pi_I^m$ | $\pi_I^m - (p\pi_E^d - K)$ |
| $(\pi_I^M - \pi_I^m < K/p)$ | 0 | $p\pi_E^d - K$ |

- *If $\delta[p\pi_E^d - K] < \overline{\pi}_I - \underline{\pi}_I$, the incumbent will "accommodate", it will take over $E$ by paying $p\pi_E^d - K$, and will invest in the project iff $\pi_I^M - \pi_I^m \geq K/p$.*

*Proof.* Consider first the case where $\pi_I^M - \pi_I^m \geq K/p$. By accommodating, the total profits of the incumbent will be $V_I^a = \overline{\pi}_I + \delta[p\pi_I^M + (1-p)\pi_I^m - p\pi_E^d]$. By fighting, they will be: $V_I^f = \underline{\pi}_I + \delta[p\pi_I^M + (1-p)\pi_I^m - K]$. It is immediate that $V_I^f \geq V_I^a$ iff $\delta[p\pi_E^d - K] \geq \overline{\pi}_I - \underline{\pi}_I$. Consider next the case where $\pi_I^M - \pi_I^m < K/p$.

By accommodating, the total profits of the incumbent will be $V_I^a = \overline{\pi}_I + \delta[\pi_I^m - (p\pi_E^d - K)]$. By fighting, they will be: $V_I^f = \underline{\pi}_I + \delta[\pi_I^m]$. It follows that $V_I^f \geq V_I^a$ iff $\delta[p\pi_E^d - K] \geq \overline{\pi}_I - \underline{\pi}_I$. □

**Discussion and the "kill zone" argument** This extension allows us to focus our attention on exclusionary conduct as an alternative strategy for an incumbent to remove a potential competitor.[27]

While there are reasons to think that a takeover may be a more convenient way to exclude a potential rival, because it does not entail the dissipation of market profits,

[27] As discussed in Section 2.2, the threat may come from a complement, and a platform may want to use foreclosure to avoid any risk of dis-intermediation, as discussed inter alia by Bourreau and de Streel (2019) and Scott Morton et al. (2019, pp. 72-73). The latter mentions the example of Facebook, which excluded the video-capture-and-sharing app Vine when Vine attempted to link its users to their Facebook friends. A discussion of abuse of dominance cases involving big tech firms is beyond the scope of this paper. The European Commission has certainly been at the forefront of competition enforcement in this area, as witnessed by its decisions against Google (*Google Shopping*, 27 June 2017; *Google Android*, 18 July 2018, *Google AdSense*, 20 March 2019), and its ongoing investigations on Amazon's Marketplace and on Apple's App Store's policies towards Spotify.

there may be reasons for an incumbent to select an exclusionary conduct.[28] In some cases, the start-up might have very optimistic predictions about its future, or may want to have a fair share of the profits that its elimination would save to the incumbent;[29] or the exclusionary conduct may not be costly in the short-run, as it would be the case when the incumbent can imitate the start-up's features.

But note that exclusionary conduct and acquisition may actually be complementary, rather than substitute, strategies. As we have seen, an exclusionary strategy allows the incumbent to reduce the acquisition price: as showed in Table 2, by "fighting" the potential entrant, $I$ reduces the price at which it will take it over. This is very similar to Saloner (1987)'s model, which formalises the old argument that predation allows to acquire a rival at a lower price.

This discussion also bears on the so-called "kill zone" argument, according to which new firms would stay away from the core market of large digital platforms, not to be killed by their aggressive behaviour or acquisition strategies.[30] First of all, note that the prospect of being acquired should actually *push* a start-up towards, rather than deter from, the territory that an incumbent intends to protect. This way, the start-up would be able to get at least a fraction of the monopolist profits that the incumbent saves through the acquisition.[31] The existence of a "kill zone", if any, could therefore not be explained by the possibility of being acquired, but rather by the threat that the incumbent may engage in exclusionary practices to prevent competition from taking place. And if the start-up ends up being acquired, it will be at a much lower price, which is driven down by the fact that an exclusionary practice reduces the outside value of the start-up.

In Motta and Shelegia (2020), a start-up operates in a complementary market to an incumbent's primary product, and it may choose between a trajectory leading it to a substitute or to another complement of the incumbent. As they show, if the start-up expects the incumbent to have an incentive to engage in an exclusionary strategy (refusal of interoperability or imitation), then it will prefer to stay away from the incumbent's primary product and develop another complement instead.

[28] In some jurisdictions, including the US, antitrust enforcement against exclusionary conduct and merger control have been notoriously lenient, so competition law alone would not explain preference for either strategy.

[29] In terms of our model, the incumbent may not necessarily have all the bargaining power.

[30] See e.g., The Economist, "Into the danger zone. American tech giants are making life tough for startups," June 2, 2018.

[31] Again, in our base model the entrant is just offered its outside value for simplicity, but more generally it may be able to share some of the monopoly profits of the incumbent.

# 3 Big tech mergers: Some recent theories of harm

Big tech mergers do not exclusively concern potential competitors. They sometimes involve actual competitors. The purpose of this section is to point to theories of harm other than the removal of potential competitors in the context of big tech. We do not claim to provide an exhaustive list of such theories.[32] Also, with more and more big tech mergers being scrutinised by AAs additional theories of harm are likely to be put forward in the future. Insights into the effects of mergers developed in other contexts may well apply to big tech mergers and vice versa.

In this section, we point to several specific market environments in which big tech mergers can be investigated under the following recent theories of harm. First, mergers might be detrimental to consumer welfare in markets in which consumers pay a zero price. Second, when increasing the installed base through a merger the prohibition of the privately most valuable merger can lead to a better outcome for consumers because this results in a different merger from which consumers are even better off even though the former merger would also increase consumer surplus. Third, a merger of firms operating two-sided platforms can be anti-competitive because of induced price effects. Fourth, a conglomerate merger that allows the combination of data may be anti-competitive. Fifth, a conglomerate merger that enables one-stop shopping can inflict consumer harm. Sixth, a conglomerate merger with bundling of a "free" service may be profitable but make a more-efficient competitor non-viable.

We acknowledge that there are also various efficiency defences that do not apply to standard industries. In particular, many big tech firms provide intermediation services that are subject to positive network effects. With positive network effects a more concentrated market may bring benefits to consumers. Thus, mergers may be seen in a more favourable light.[33] We account for some such efficiencies in the specific theories we consider below, but do not aim to provide a set of theories of efficiency defences that are relevant in the context big tech mergers.

[32] Among others, Bourreau and de Streel (2019) and Crémer et al. (2019) suggest theories of harm. The former emphasise the potentially adverse effect on innovations of big tech mergers; the latter focus on the possibility that such mergers may shield the large platforms' ecosystems from potential competitive threats. Both share a somewhat dynamic perspective: a merger may have positive short-run effects (e.g. because of additional network effects or because it leads to an improvement of the ecosystem), but adverse long-run effects may arise from lower innovation or from making it more difficult to contest a platform's dominance. This relates to Section 3.2 below.

[33] For a formal analysis in this vein with two-sided platforms, see Correia-da-Silva et al. (2019).

## 3.1 Horizontal mergers of free services with consumer single-homing

If big tech firms provide free offers to consumers, the question can be asked how consumers can suffer harm from a merger (presuming that offers remain free after the merger). Consumer not only care about price, but also product quality. In contrast to some recent work on the effect of mergers on product or service quality,[34] quality does not enter as an additional parameter to price, but is the only variable of importance to consumers. Big tech firms offer their service and divert some of the consumers' attention to advertisers; they also collect data to their own benefit, but not necessarily to the consumers' benefit.

A particular market environment consists of competing firms trying to attract single-homing consumers, as formalised in Anderson and Coate (2005). Advertisers can post ads with multiple firms. Firms provide exclusive access to their consumers. Thus, firms compete for consumers but not for advertisers. They have to balance an increase in (from a consumer's point of view undesirable) advertising with the associated loss in viewership. Holding basic service quality fixed, firms increase the ad load (i.e., the amount of time consumers spend watching advertising) if competition for consumers is relaxed.

Suppose for example that three firms compete with differentiated services. Assume that firms extract the full expected surplus from advertisers.[35] The more advertisers they host, the larger is the firms' profit per consumer. The basic trade-off for a firm when raising the ad load is to earn higher ad revenues per viewer but to lose consumers to competitors and the outside option.

If two of the three firms merge, what will happen? If the merged firm continues to operate two platforms, but internalises the effect of the ad load on one platform on profits on the other platform, it has an incentive to increase the ad load on each of its platforms compared to prior to the merger. In response, also the third firm will increase its ad load. In the equilibrium after the merger, the merged entity and the firm outside the merger will have increased ad levels. Since advertising constitutes a nuisance to consumers, consumers are worse off after the merger (advertiser surplus is unaffected).[36] Thus, even

[34] See e.g. Motta and Tarantino (2017). For an overview, we again refer to Kokkoris and Valletti (2020).

[35] When firms set the ad price per consumer or auction off an ad inventory, this is the case if advertisers are homogeneous. Otherwise, when advertisers are heterogeneous in how much a consumer is worth to them, firms are assumed to be able to perfectly discriminate on the advertiser side.

[36] The increased ad load is analogous to a higher price paid by consumers and the equilibrium effects correspond to those of mergers in which firms set prices in a differentiated product market as in Deneckere and Davidson (1985). The analysis on the advertiser side becomes more intricate if advertisers are heterogeneous and pay a uniform ad price and thus the surplus of infra-marginal advertisers is not fully extracted. See Anderson and Peitz (2020) for a formal analysis.

though consumers receive a free service, they may be harmed by a merger.

Relatedly, suppose that firms have a fixed ad load, but that advertisers can only extract a fraction of the surplus they generate from consumers that depends on the extent to which advertisers can access the data firms collect about their consumers. Firms charge for advertising and decide on the degree of data sharing. The more consumer data they share with an advertiser, the larger the fraction of surplus the latter can extract from consumers—we suppose that an advertiser cannot combine the information provided by multiple firms. The tradeoff for a firm is that the more it enables advertisers to extract surplus from consumers the less attractive they become to consumers and, thus, the fewer consumer will pick this firm. A merger then implies that, in equilibrium, firms enable advertisers to better extract surplus from consumers than prior to the merger and, as a result, consumers are worse off after the merger. Under our assumption that advertiser rents are fully extracted by firms, advertiser net surplus (after paying for advertising) is zero before and after the merger. Hence, the merger is consumer surplus decreasing no matter whether or not advertisers are included in the calculation of consumer surplus.

## 3.2 Installed base, complementary technologies, and competing merger proposals

In the presence of installed base, the motive for an acquisition may be not so much the demand-side efficiency arising from the consolidation of installed base, but that the acquisition deprives a competitor from reaching demand-side efficiencies itself and becoming a stronger competitor.[37] While overall consumers may benefit from such a merger under the status quo, they would be even better off if the merger was prohibited leading to an alternative merger.

Suppose that there are three firms and a total installed base of 4. Prior to a merger, firm $A$ has an installed base of 2 and firms $B$ and $C$ of 1. Suppose that firm $C$ is the takeover target and firms $A$ and $B$ can bid for the firm. If we treat the installed base prior to the merger as an asset, we can look at the combined asset after a merger. Furthermore, suppose that each of the two mergers is profitable and that the merger between firms $B$ and $C$ is consumer welfare increasing. The latter is likely to hold if a combined installed consumer base of 2 allows the merged firm to make consumers a more attractive offer because of demand-side efficiencies.

By consolidating its user base, firm $A$ deprives firm $B$ of the possibility to compete

[37]For a general exposition that is not framed in terms of installed base or complementary quality-improving technologies but on cost reductions, see Nocke and Whinston (2013).

on equal terms. Denoting duopoly profits conditional on acquired user base by $\pi(n_i, n_j)$ for a firm with an installed base of $n_i$ and the competitor with a base $n_j$ after the merger, the acquisition of firm $C$ is worth $\pi(3,1) - \pi(2,2)$ to firm $A$ and $\pi(2,2) - \pi(1,3)$ to firm $B$. The condition that firm $A$ is willing to bid more than firm $B$ can be rewritten as $\pi(3,1) + \pi(1,3) > 2\pi(2,2)$ saying that duopoly industry profits are larger if assets are distributed more asymmetrically. Blocking the merger between firms $A$ and $C$, would lead to a symmetric duopoly outcome.

To analyse the effect of installed base, consider the quality-augmented Cournot model with linear demand and zero cost of production. Quality is increasing in installed base. Suppose that to clear the market with a total quantity $Q$ in the market, the price of a product with an installed base of 1 is $P(Q) = 2 - Q$. With an installed base of 2, the product is more valuable shifting the inverse demand curve upward to $P(Q) = 3 - Q$. Finally, if the installed base is 3, the product is even more valuable shifting the inverse demand curve upward to $P(Q) = (7/2) - Q$.

Prior to the merger, the Cournot equilibrium is $q_A^{*0} = 5/4$ and $q_B^{*0} = q_C^{*0} = 1/4$. Thus, total quantity is $Q^{*0} = 7/4$. The associated equilibrium profits are $\pi_A^{*0} = 25/16$ and $\pi_B^{*0} = \pi_C^{*0} = 1/16$. If firm $A$ acquires firm $C$, firm $A$ maximises $((7/2) - q_A - q_B)q_A$ with respect to $q_A$ and firm $B$ maximises $(2 - q_A - q_B)q_B$ with respect to $q_B$. Solving the system of first-order conditions, we obtain that $q_A^{*1} = 5/3$ and $q_B^{*1} = 1/6$. Thus, total quantity is $Q^{*1} = 11/6$. The associated equilibrium profits are $\pi_A^{*1} = 25/9$ and $\pi_B^{*1} = 1/36$. Since $\pi_A^{*1} > \pi_A^{*0} + \pi_C^{*0}$ the merger is profitable. It is consumer surplus increasing because $Q^{*1} = 11/6 > 7/4 = Q^{*0}$. We conclude that this merger in isolation should be approved by the AA when its decision is based on consumer surplus.

Consider instead the merger that firm $B$ acquires firm $C$. We then have a symmetric duopoly in which each firm $i \in \{A, B\}$ maximises $(3 - q_i - q_j)q_i$ with respect to $i$ with $j \in \{A, B\}, j \neq i$. Equilibrium quantities are $q_A^{*2} = q_B^{*2} = 1$. Total quantity is $Q^{*2} = 2$ and equilibrium profits are $\pi_A^{*2} = \pi_B^{*2} = 1$. Since $\pi_B^{*2} > \pi_B^{*0} + \pi_C^{*0}$ the merger is profitable. It is also consumer surplus increasing because $Q^{*2} = 2 > 7/4 = Q^{*0}$.

If firms $A$ and $B$ bid for firm $C$, they know that if their bid is not accepted, their competitor will merge. A competition authority which waves through any proposed consumer surplus increasing merger will not intervene (because both mergers are consumer surplus increasing). In the example, it is easily verified that $\pi_A^{*1} - \pi_A^{*2} = 16/9 > 35/36 = \pi_B^{*2} - \pi_B^{*1}$. This means that firm $A$ is willing to bid more than firm $B$ and firm $A$ will acquire firm $C$. If the AA is aware of the fact that the relevant counterfactual is not the status quo but a merger between firms $B$ and $C$, it should compare the consumer surplus when firm $A$ merges with firm $C$ to the one when firm $B$ merges with firm C. Since $Q^{*1} < Q^{*2}$

consumer surplus will be larger if the AA prohibits the merger between firms $A$ and $B$. Thus, in line with Nocke and Whinston (2013), the AA should be forward-looking and not follow a myopic merger policy. The theory of harm of approving a proposed merger, which at first glance looks consumer surplus increasing (i.e., compared to the status quo) closes the door to other mergers that are better for consumers and will be proposed only after the AA rejects the initial proposal.[38] Put differently, when an AA evaluates a merger, its relevant counterfactual is not the status quo but the consummation of a different merger. The same argument can be made when firms have proprietary complementary technologies that positively affect the willingness to pay of consumers or reduce the marginal cost of production.[39]

## 3.3 Horizontal mergers, consumer multihoming, and indirect price effects

As explained above, big tech firms operating two-sided platforms may provide a service to users for free and sell part of the attention given by consumers on to advertisers. A different, anti-competitive concern of mergers arises if consumers multi-home and if there is competition between advertisers in the product market in which advertisers operate as sellers. Since consumers multi-home, advertisers receive attention if they appear on one of the platforms (suppose that it is enough if advertisers obtain one slot). Platforms have an incentive to limit the number of ads on the platform to be increase the ad price. By posting an ad on all platforms, an incumbent seller who can reach out to consumers even without advertising may then want to advertise on all platforms as a means to foreclose a seller who remains unknown absent advertising. This may also be in the interest of

[38] An interesting twist in our example is that absent demand-side efficiencies arising from a merger between $A$ and $C$, it will be firm $B$ which outbids firm $A$. In this case, the AA would not need to step in to ensure that the socially most desirable merger will be consumed. According to our example, a myopic merger policy gets it wrong when demand-side efficiencies that arise when the firm with the largest installed base acquires a competitor, are sufficiently strong, but is optimal when these efficiencies are absent or sufficiently weak.

[39] Regarding the former, Bryan and Hovenkamp (2020) show in a model with differentiated products that the acquisition by the stronger potential acquirer prevents its rival from obtaining access to a new technology developed by the target. Its motivation for the acquisition may thus be to exclude its weaker rival from gaining access to the target's technology, which may endanger the long-term viability of the rival. Consumers may then suffer if the AA approves the merger between the stronger firm and the target (or does not impose appropriate remedies). Regarding the latter, the following numerical example is equivalent to the one above in terms of equilibrium quantities and profits: Consider a three-firm linear Cournot model with constant marginal cost of production. The inverse demand curve is $P(Q) = 4 - Q$. Prior to a merger, firm $A$ has constant marginal cost of production $c_A = 1$ and firms $B$ and $C$ have $c_B = c_B = 2$. If $A$ acquires $C$ its marginal cost is reduced to $c_A^m = 1/2$; if $B$ acquires $C$ its marginal costs becomes $c_B^m = 1$.

the big tech firm as it monetises on the advertiser side. It is then easily understood that markets with all platforms under a single owner perform very differently from markets in which each platform is operated by an independent firm: A single owner offers a bundle of advertising on all channels and the incumbent advertiser pays for the attention of consumers on all platforms and entrant advertisers are foreclosed. With independent platforms it is too costly for the established advertiser to foreclose the competitor. Then, all advertisers become visible to consumers and advertisers compete for consumers and therefore set low prices. Since independent advertisers receive low payments from the advertisers, a platform merger is profitable.

Based on Prat and Valletti (2019), we develop simple numerical examples to clarify this point. Suppose that there are two advertisers offering products $X$ and $Y$, respectively, two platforms, and the consumer side. Advertising slots on the big tech firms are auctioned off sequentially or as bundles in second-price auctions. If platforms are independent, slots are auctioned off sequentially. After a merger, the common owner can decide which format to choose. Each platform carries only one ad (with two or more ad slots advertisers would bid zero under either format). The monopoly profit with intermediated trade is assumed to be 500 and the duopoly profit is assumed to be 200. Advertisers are asymmetric in the sense that advertiser $X$ does not need access to consumers through a platform, e.g., because it is a well established brand that does not need to advertise to consumers. Thus, if advertiser $X$ does not advertise, $Y$ obtains advertising slots on the two platforms, and thus advertiser $X$ obtains duopoly profits.

With sequential auctions, we start with the second auction. If advertiser $X$ won the first auction, the analysis from above applies. Thus advertiser $X$ wins the second auction at price 200. If advertiser $Y$ won the first auction, both advertisers will bid zero as it does not matter who wins the auction. In the first auction, advertiser $X$ obtains 300 if it wins and 200 if it loses. Thus it is willing to bid 100. Advertiser $Y$ obtains 200 if it wins the first auction and 0 if it loses. Thus it is willing to bid 200. Hence, advertiser $Y$ will win the first auction and pay 100; both advertisers then bid zero in the second auction. If it is equally likely that firms 1 and 2 run the first auction the expected profit of each independent platform is 50.

If the two platforms have one owner, the owner may decide to auction off the bundle of one slot on each platform. Winning the auction gives advertiser $X$ the profit 500 while losing gives 200. Thus advertiser $X$ bids 300. Since advertiser $Y$ is only willing to bid 200, advertiser $X$ wins the auction. It has to pay 200 and obtains a net profit of 300. This implies that the owner of the two platforms will make a profit of 200. With sequential auctions the joint profit of the two platforms is 100 which is less than in the

case in which the bundle is auctioned off.

This finding can be interpreted as follows. A merger between platforms (which coordinate their selling of attention) is profitable because it reduces product market competition. The ensuing higher seller profits are partly extracted by the intermediary who runs the platforms. The merger is consumer welfare and total welfare decreasing as it preserves the monopoly position of one of the advertisers in the respective product category. This issue arises if the attention market becomes rather concentrated after the merger (as is clearly the case in our example).[40]

## 3.4 Conglomerate mergers and the collection of data

Mergers affect the volume of data available to firms. Data may allow firms to offer better services to consumers, to better price discriminate between consumers, to provide better services to advertisers, and to better extract surplus from advertiser. Here, we sketch a stylised model in which data provide better services to advertisers in the sense that advertiser surplus is increased.[41] We consider a set of firms that use the data generated from their consumers; no data sharing or data sales are considered possible.[42] When merging firms can combine their data after a merger, a conglomerate merger of ad-financed firms operating in independent product markets will affect market outcomes. Some of the reports that we mentioned in the introduction have pointed to the importance of data in the context of mergers. According to the logic of the model developed below, the competition concern is the efficiency-offence argument in a new dress. This shows that the difficulty to develop a data-based theory of harm.

More specifically, consider the environment in which firm $A$ is active in consumer market 1 and there are two firms $B$ and $C$ in consumer market 2. Each consumer market is of size 1. Each firm generates consumer data whose volume is denoted by $\delta_i$, which is assumed to be increasing in the number of buyers of the respective product. Each firm $i$ offers a service of quality $s_i$ for free to consumers. For simplicity, suppose that firm $A$ will decide to fully cover market 1 no matter whether it operates as an independent firm or acquires firm $C$, the service quality that achieves full participation is denoted by $\overline{s}_A$; it comes at a cost of $K(\overline{s}_A)$.[43] Firms monetise on the advertiser side. We assume that it

[40]Looking beyond the two-platform example, another take-away for AAs is that it matters how many consumers are using a certain set of platforms; that is, the actual and counterfactual homing decisions of consumers are important to evaluate the effect of the merger.

[41]Our exposition is inspired by de Cornière and Taylor (2019).

[42]This appears to be the relevant case for personal data in jurisdictions such as the European Union in which firms are not allowed to sell or share personal data without the explicit consent of users.

[43]As de Cornière and Taylor (2019) point out, if there is partial coverage in market 1, a merged

is on this side only that the volume of data matters: advertiser surplus increases in the volumes of data. We denote the advertiser surplus per consumer generated on firm $i$ by $a_i(\delta_A, \delta_B, \delta_C)$, which is assumed to be increasing in each $\delta_i$. The idea here is that with more consumer data the match quality between advertiser and consumer is improved even if those data are collected from consumer activities not directly linked to the particular market.[44] Thus, a given number of impressions generates a higher ad surplus.

Consider the special case that firms can extract the full advertiser surplus. Absent the merger, firm $A$ then obtains revenues $a_A(\delta_A(1), 0, 0)$ in market 1. Firms $B$ and $C$ compete for consumers by each setting its service quality $s_i$ which comes at a cost $K(s_i)$, which is increasing and convex. The market share of firm $i \in \{B, C\}$ is denoted by $\lambda_i(s_i, s_j)$ which is increasing in $s_i$ and decreasing in $s_j$, $j \neq i$; again we assume full market coverage, i.e. $\lambda_B(s_B, s_C) + \lambda_C(s_B, s_C) = 1$. Firm $B$'s profit is then $\lambda_B(s_B, s_C)a_B(0, \delta_B(\lambda_B), 0) - K(s_B)$. The profit of firm $C$ is $\lambda_C(s_B, s_C)a_C(\delta_A, 0, \delta_C(\lambda_C)) - K(s_C)$ where $\delta_A = 0$ without the merger and $\delta_A(1)$ with the merger. An equilibrium in market 2 absent the merger consists of a pair $(s_B^*, s_C^*)$. This equilibrium is independent of what happens in market 1. We postulate that such an equilibrium exists and is unique.

Suppose now that firm $A$ acquires $C$. The merged firm can now combine data from markets 1 and 2. The merged firm's profit $\pi^M$ is now

$$a_A(\delta_A(1), 0, \delta_C(\lambda_C(s_B, s_C))) - K(\overline{s}_A) + \lambda_C(s_B, s_C)a_C(\delta_A(1), 0, \delta_C(\lambda_C(s_B, s_C)), 0) - K(s_C).$$

For given behaviour of firm $B$ the merger is profitable for two reasons. First, in market 1 the firm now obtains higher ad revenues $a_A(\delta_A(1), \delta_B(\lambda_B), 0)$. Second, the firm also obtains higher profits in market 2. The firm has an incentive to increase quality $s_C$. By increasing its quality (given the competitor's quality) it increases its market share. This affects profits in two ways: First, it generates additional ad revenues in market 1; second, the per-consumer ad revenue is higher after the merger; this makes it more attractive to gain market share. How does the competitor respond? The competitor is now in a weaker position as it cannot compete with firm $C$ on equal terms. If $s_B$ and $s_C$ are strategic complements, after the merger both firms will provide higher qualities; the proposed merger would then be consumer-welfare increasing, and advertisers would not be affected.[45] If they are strategic substitutes, the stand-alone firm provides lower

firm may have an incentive to achieve larger market coverage in this market than a firm operating independently in this market. This makes it more likely that a merger is consumer-welfare increasing.

[44] On the role of data in improving match quality, see, for instance, Belleflamme and Peitz (2018).

[45] More data may go hand-in-hand with better extracting advertiser surplus. If this were the case then advertisers would suffer from the merger (while consumers continue to be better off).

quality after the merger (see below).

Take a special case that results in strategic substitutes: Suppose that ad revenues $a_B$ and $a_C$ do not depend on the volume of data in market 2, but only on the volume of data in market 1. The setting then gives rise to profit functions $\pi_A = a_A(\delta_A(1), 0, 0)$ and $\pi_C = \lambda_C(s_B, s_C)a_C(0) - K(s_C)$ before the merger and $\pi^M = a_A(\delta_A(1), 0, \delta_C(\lambda_C(s_B, s_C))) - K(\bar{s}_A) + \lambda_C(s_B, s_C)a_B(\delta_A(1)) - K(s_C)$ after the merger; firm $B$'s profit function in both cases is $\pi_B = \lambda_B(s_B, s_C)a_B(0) - K(s_B)$. Clearly, firm $B$'s profit maximising quality $s_B$ is decreasing in $s_C$. Hence, in this case, qualities are strategic substitutes. This implies that due to the data advantage of the merged firm, firm $B$ will provide less quality $s_B$ to consumers after the merger, while firm $A$ will provide higher quality $s_C$. The profit of the merged firm is higher, while the profit of firm $B$ is lower after the merger. If operating in the market is costly, firm $B$ may be forced to exit the market. This is a version of the efficiency offence argument: Due to the advantage in data the merger makes the merged firm a stronger competitor; this is consumer-welfare increasing in the short run (for a given number of firms), but may be harmful to consumers (and society) in the long term, as firms may be induced to exit. Even with exit, consumers may well be better off as they may enjoy a high service quality and the conglomerate merger is then consumer-surplus increasing. However, this is not always the case. Suppose that $a_A(0, \delta_B(\lambda_B), 0) = 0$ for $\lambda_B$ sufficiently small. Since an equilibrium with a merger has to feature $\lambda_B < 1/2$, firm $B$ may not be able make positive profit as the revenues on the advertiser side in the equilibrium candidate do not cover its costs. In the long term, firm $B$ exits and the merged firm then chooses the unconstrained monopoly solution. This solution may feature a lower service quality than the one under competition prior to the merger.[46]

De Cornière and Taylor (2019) provide a richer environment in which data can be used for various purposes. While we specified a setting in which data are pro-competitive in the sense that $s_i$ is increasing in $\delta_i$, they also provide examples for the opposite situation, namely that a larger volume of data decreases the utility offered to consumers and thus data are anti-competitive. In such a situation the merger between firms $A$ and $C$ reduces consumer welfare in market 2; consumers in market 1 are not affected.

Furthermore, within a pro-competitive environment, suppose that prior to the merger firm $A$ can share its data with firms $B$ and $C$. De Cornière and Taylor (2019) focus on the case in which firm $A$ maximises its profit by sharing its data with only one of the two firms prior to the merger and analyse the situation in which data collection is endogenous.

[46] We are not suggesting that the firm actually reduces its quality after exit, but in an evolving market it may simply relax and stop to upgrade its service quality (or slow down this process).

Additional data collection in market 1 here not only increases the profits of the firm with data access in market 2, but also reduces the profit of the firm 2 without data access. Data collection before the merger is then excessive from the point of view of maximising firm $A$ and $C$'s joint profit. After the merger of $A$ and $C$ data from market 1 can still be given to firm $B$. However, the merged firm refuses to share these data with firm $B$ after the merger and reduces its efforts to collect data, as $C$'s profits are fully internalised when choosing how much data to collect.[47] As a result of less data collection, the merger is consumer-surplus decreasing in the short term in markets 1 and 2.

Our conclusion is that it is possible to construct theories of consumer harm based on the combination of data. However, such theories will only be applicable to very specific cases.

## 3.5 Conglomerate mergers and synergies through one-stop shopping

A conglomerate merger may lead to consumption synergies because of the benefits of one-stop shopping this entails for consumers. Rhodes and Zhou (2019) provide a formal analysis of the competitive effects of a conglomerate merger that enables consumers to engage in one-stop shopping. They consider two independent product markets with two firms in each market and postulate that products are differentiated in each market—consumers have heterogeneous match values—and that consumers engage in costly and sequential search to learn the price and match value of the respective product. A conglomerate merger allows consumers to learn price and match value about a product in each market with a single search. Rhodes and Zhou (2019) show that after a single conglomerate merger there is an equilibrium in which consumers first search out the conglomerate firm (this is driven by the consumption synergy from one-stop shopping). In this equilibrium the conglomerate firm charges lower prices than its single-product competitors, but makes higher profits than the combined profits of its single-product competitors.

In the merger game, for sufficiently low search costs, only a single conglomerate merger is profitable and, thus, the above asymmetric market structure emerges. As Rhodes and Zhou (2019) show, compared to the market structure in which all firms remain independent, consumers are worse off with the merger. Therefore, the conglomerate merger inflicts consumer harm.[48]

[47] Therefore, the merger is profitable.

[48] This happens if the search cost are below some threshold. However, because of the synergies gener-

## 3.6 Conglomerate mergers and the bundling of free services

We address here another competition concern with conglomerate mergers. Consider the environment in which firm $A$ is active in market 1 and there are two firms $B$ and $C$ in market 2, with firm $B$ being more efficient than $C$ in the sense that it offers higher utility to consumers. The project development costs $K$, and the probability of success is $p$. These probabilities are independent. Thus if both firms develop the project, with probability $p^2$ there will be competition in market 2. We focus on the case in which without any merger, all firms are active (at the end they endogenise the decision to develop the project). Prior to any merger, firm $A$ makes profit $\pi_A^1$ and firms $B$ and $C$ make profits $\pi_B^2$ and $\pi_C^2$ with $\pi_B^2 > \pi_C^2$.

Suppose that firms $A$ acquires $C$; the merged entity's profits has super-script $M$. Absent synergies or any strategic effects across markets, this merged firm would make profit $\pi_A^M = \pi_A^1 + \pi_C^2$. Clearly, firm $A$ is willing to bid $\pi_C^2$ and the firm is indifferent as to whether the merger goes through. Also, the merger does not change the allocation. We will now look beyond the simple reduced-form setting and provide a leverage theory that is of particular relevance in the context of big tech to show that a merger can be profitable but total welfare reducing. The underlying economic mechanism has been elaborated by Choi and Jeon (2020), which we embed into the context of a merger. We describe the basic argument and develop a simple numerical example.

Suppose that firm $A$ attracts consumer attention by offering a product in market 1 at the monopoly price. In the other market the two firms offer their product at a non-negative price and on top monetise on the advertiser side (which consumers do not mind). Firm $B$ is more efficient in the sense that it offers higher quality at the same cost (marginal cost equal to zero). Firms $B$ and $C$ are Bertrand competitors in case both have developed their product. In this case, firm $B$ makes the asymmetric Bertrand profit and firm $C$ obtains zero profit. Prior to the merger the two markets are independent.

If firm $A$ merges with a firm with a project in market 2, it may sell a product bundle to consumers. We restrict attention to firm $A$ acquiring firm $C$. Then, in case of competition in the market 2, it can offer a better deal to consumers than firm $B$ by setting a low price for the bundle. It also has an incentive to do so if the quality difference between $B$ and $C$ is not too large. Since consumers would like to consume both types of content, they choose the bundle if the bundled price is not too high (here we suppose that a consumer cannot buy product $B$ if she buys the bundle). In return the merged firm offering the bundle attracts all consumers and obtains the advertising revenues whenever $C$ is active.

ated by the merger, total surplus is larger after the merger.

The point is that because of advertising opportunities there is a positive surplus on the table in market 2. The novel insight arises because of a monetisation opportunity on a different market and the fact that the competitor to the merged firm does not have a sufficiently flexible strategic instrument to attract consumers (it cannot set a negative price to consumers).

The specific timing we have in mind is the following: first, firms $B$ and $C$ decide whether to develop their projects and in case they do Nature decides which if any of the projects by $B$ and $C$ are successful; second, firm $A$ makes a take-it-or-leave-it offer to firm $C$, which firm $C$ accepts or rejects. If the merger goes through, $A$ decides whether to commit to bundling. And finally before advertisers decide where to advertise and consumers decide which if any products to buy, firms simultaneously set prices to consumers and advertisers.

For concreteness, we develop a numerical example. There are 100 identical consumers who all attach the value of 2 monetary units to product $A$; 2 to the product offered by firm $B$; and 1 to the product offered by $C$. The success probability of firms $B$ and $C$ is $1/2$, which is independent across firms. In addition, each consumer generates advertising revenue of 3 in market 2 leading to total advertising revenues of 300. All firms incur zero cost.

Suppose that firms $B$ and $C$ developed their products. Absent merger, firm $A$ sells its product at price 2 and makes profit of 200; firm $B$ sells at price 1 and makes profit of 400 (revenues on the consumer side of 100 plus revenues on the advertiser side of 300) in case both firms $B$ and $C$ are successful, which occurs with probability $1/4$. With probability $1/4$, it is the only one successful and then sells the product at price 2 making overall profit of 500 in this case. Hence, the expected profit of firm $B$ is 225. With probability $1/4$, firm $C$ is the only one successful and then sells the product at price 1 making overall profit of 400 in this case. Hence, the expected profit of firm $C$ is 100.

We continue with the case that firms $B$ and $C$ developed their products and consider now the possibility of a merger. With probability $1/4$, firm $C$ is the only one successful and then sells the bundle at price of 3 making overall profit of 600 in this case (300 from selling the bundle and 300 on the advertiser side). This corresponds to the combined profits of $A$ and $C$ absent the merger and thus there are no strict incentives to engage in the merger. When project $C$ is not successful (which occurs with probability $1/2$), firm $A$ clearly has no incentive to merge; in continues to sell in market 1 at the price of 2 and makes profit 200. The interesting case is when projects $B$ and $C$ are successful. If firm $A$ acquires $C$ and commits to sell a bundle, it has an incentive to sell the bundle at a price slightly less than 1. When buying the bundle each consumer obtains a net

benefit of a little bit more than 2. Alternatively, consumers could decide not to buy the bundle and only buy $B$. The lowest price firm $B$ can charge is zero. In this case, each consumer would get a net benefit of 2. Hence, consumers decide to buy the bundle and firm $A$'s profit is 400. Thus, with the merger firm $A$ gains an additional 200. Absent the merger, firm $C$ would have earned zero. Hence, for any acquisition price between 0 and 200 the merger is profitable for both parties and the merger will take place unless it is prohibited by the AA.[49] Advertiser surplus is unaffected (it is zero); consumer surplus increases from 100 to 200. Bundling allows firm $A$ to leverage its monopoly position into a competitive market and to drive a more-efficient competitor out of the market when this firm has developed a higher-quality product. As a result, the merger is total welfare decreasing. However, an AA focusing on consumer surplus would not prohibit the merger taking the investment as given.

We now take a quick look at the ex ante incentives of firm $B$. Absent the merger, firm $B$'s expected surplus is 225 (with probability 1/4 it makes a profit of 400 and with probability 1/4 of 500) whereas with the possibility of firm $A$ acquiring $C$ it is 125 (with probability 1/4 it makes a profit of 500). Thus, if the development cost is between 0 and 125 firm $B$ will develop the project in any case; if the development cost is between 125 and 225 it will only develop if a merger between $A$ and $C$ is not allowed or not profitable.

Hence, the above characterisation holds along the equilibrium path for the development cost between 0 and 125. When the development cost passes the threshold of 125 then, with the possibility of a merger, firm $B$ knows at the development stage that its development costs exceed the expected profit. Then, firm $B$ does not invest. As a result, the merger is an off-equilibrium threat that chills investment. Firms $A$ and $C$ extract monopoly rents from their respective markets: firm $A$ obtains 200 and firm $C$ expects 200 (400 with probability 1/2); this is the outcome for development costs between 125 and 200. Then, a merger that includes the acquired free offer into a bundle can possibly leverage monopoly power from one market into another; this can be seen as creating a "kill zone", as more-efficient competitors would decide not to enter market 2. Allowing such mergers here reduces total welfare and consumer welfare.

[49]We observe that also a merger between $B$ and $C$ would be profitable, as this would lead to the monopoly outcome. We do not consider a merger between $B$ and $C$ on the ground that a competition authority would reject a merger that removes the only competitor and thus leads to monopolization. If we allowed $A$ to acquire $B$ the latter would agree to be acquired at any positive price if it anticipated that otherwise $A$ were to acquire $C$ for sure. However, if $A$ has the capacity to either try to acquire $B$ or $C$ then approaching $B$ does not allow $A$ to increase its profit after a successful merger because $B$ will ask for at least 400 to agree to the acquistion, whereas approaching $C$ does. In this case, $A$ will acquire $C$ instead of $B$.

# 4 Conclusion

We have argued in this paper that some big tech mergers may well have adverse competitive effects. Foremost, the risk that the merger removes a potential competitors often deserves careful consideration. We have developed a simple formal framework that allows us to address some basic considerations as to when such mergers are likely to be anti-competitive (Section 2). We have also provided an informal account of recent theories of harm of mergers involving actual competitors (Section 3). This suggests that some mergers in digital industries, including conglomerate mergers, raise anti-competitive concerns and hence require the scrutiny of Antitrust Authorities (AAs).

What are the implications for merger policy? For sure, the current situation where acquisitions of big tech firms are systematically not investigated cannot go on. This implies first that the relevant mergers should be notified, and second that AAs should have the means to stop those mergers that are deemed anti-competitive. We discuss each point in turn, in what follows.

Regarding the first point, the vast majority of acquisitions by large digital platforms have not been investigated simply because they did not meet the turnover thresholds that in most jurisdictions would trigger notification. (As mentioned above, in digital industries firms often start monetising only when they have reached considerable customer base.) For this purpose, notification thresholds based on the acquisition price seem to us a useful complementary screening device (see e.g. Motta and Peitz, 2019). Another possibility is to use a "share of supply" criterion as in the UK, Portugal, and Spain, whereby a merger should be notified if the market share of the combined entity were above a certain threshold.[50]

However, none of these criteria allow AAs to investigate acquisitions by big tech firms of some young start-ups that have neither substantial turnover nor built up a substantial user base or given other clear indications that they are likely to succeed—and thus their prospects are unclear and they may be a "cheap" target. Given the possible competitive risks that such acquisitions may have, we think that the proposal by Furman et al. (2019) to oblige big tech firms with a special status to notify all of their acquisitions deserves careful consideration.[51] Implementing this proposal does not mean, of course, that these firms should never acquire smaller companies (most of such acquisitions probably concern

[50]Facebook/Instagram and Google/Waze were reviewed by the UK authorities precisely because of the share of supply criterion used there. Similarly, the EU reviewed Facebook/Whatsapp because it was referred by the Spanish competition authority.

[51]The Furman Report proposes to designate large digital platforms endowed with enduring market power on a bottleneck market with a "strategic market status" which carries certain obligations. The report does not specify the exact criteria to be used to designate certain platforms with such a status.

start-ups which are developing new tools or very basic innovations, and are unlikely to be anti-competitive), but simply that the AAs should have the chance to look into these mergers and — where doubts arise — be able to assess whether possible pro-competitive effects outweigh the competition concerns.

We now turn to the second point above, which is how to deal with big tech mergers, once notified and if decided to investigate them.[52] Specifically, we think that both the question of where to place the burden of proof, and what the standard of proof is, need some rethinking. As things stand, merger control imposes the burden of proving that the mergers are anti-competitive on the AAs. We have suggested elsewhere that for any horizontal merger, for which theory suggests competitive harms can be neutralised only when efficiency gains are strong enough, the burden of proof that their merger is pro-competitive should be placed on the merging firms instead.[53] This should hold for any sector, and we submit that a fortiori merger policy would benefit from a reversal of the burden of proof in case one of the merging parties has an entrenched dominant position, as it is the case for some of the big tech firms. The merging parties would then need to provide evidence that either the merger does not raise any significant competitive issue (this will be the case for instance when the target is a small company which is developing tools and/or may be acquired only for its human capital — and we would expect such cases to be the majority) or that expected efficiency gains (which include dynamic efficiency gains) are sufficiently strong to justify the acquisition.[54]

Note that the balancing of efficiency gains with competitive harms needs some re-thinking too. An improvement in a firm's offering due to the merger may be seen to justify the acquisition of a potential competitor when the probability that the latter firm will become an effective competitor in the future is considered small. Even more wor-

[52]Of course AAs may also have difficulties in screening mergers, that is, understanding which ones among the many ones notified may raise issues. It is sometimes argued that a high premium of the acquisition price may indicate that the acquirer's gains from removing an actual or potential competitor are large, and hence be suspicious. However, it is worth remembering that such a premium may also be due to large firm-specific efficiency. Also, a large premium is not a necessary condition for the acquisition to be suspicious. Indeed, we have seen that if the incumbent adopts an exclusionary strategy, the start-up may be willing to sell its business even for a small premium.

[53]See Motta and Peitz (2019).

[54]Scott Morton et al. (2019) suggest to create digital authority (DA), a sector regulator which would also have additional power over merger review. "These specific merger regulations should require merging firms to demonstrate that the combination will affirmatively promote competition. This shifting of the burden of proof from the government (to prove harm) to the parties (to prove benefit) will assist the DA by placing the job of demonstrating efficiencies on the parties, who have a greater ability to know what they are." (Scott Morton et al., 2019, p. 111) The ACCC (2019, p. 199) contemplates that "it may be worthwhile to consider whether a rebuttable presumption should also apply, in some form, to merger cases in Australia. ... [A]bsent clear and convincing evidence put by the merger parties, the starting point for the court is that the acquisition will substantially lessen competition."

rying, the standard of proof for blocking a merger with a potential competitor appears to be that it is "more likely than not" that the acquired firm would become an effective competitor. Further, Antitrust Authorities typically need to substantiate such a finding with documentary evidence which is unlikely to be easily obtained.[55]

Even if there is no "smoking gun" proof that indeed at the counterfactual the acquired firm were to become an effective competitor and the probability of the entrant being a successful competitor is deemed to be not very large, the optimal merger policy may be to prohibit the merger (or impose appropriate remedies). Clearly, if competition entails large benefits, even if it occurs with small probability, the expected benefits from it can be large compared to the benefits of integration. Therefore, the relevant criterion should be that the expected gains in consumer welfare from competition are larger than the gains that would come from the upgraded offer of the merging firm (see Section 2). Such a balance-of-harm approach has been proposed by Furman et al. (2019), and we fully agree with it.

As discussed in Section 2.3, we are aware that the prospects of being acquired by a large digital platform may increase the incentives of start-ups to innovate in the first place. However, as we discussed there, prohibiting a dominant firm does not necessarily mean that a start-up will be unable to sell out. In many instances, there will be other firms interested in taking it over.[56]

**Broader concerns** Big tech may not only develop strong and entrenched positions in several markets. Their eco-systems may play (and in some case are playing) an important role in absorbing a large part of consumer attention and accumulating personal data from many different activities. While this is convenient for many consumers—they can live their digital live in one or very few eco-systems—they also become dependent on the masters of these eco-systems.

This raises a number of issues for society, which go beyond standard market power issues. In particular, some big tech firms can dominate their eco-systems becoming a private regulator. This means that they also impose rules of conduct, i.e. which type of

[55]Crémer et al. (2019, p. 119) write: "In the Facebook/WhatsApp merger, the Commission found no documentary evidence that WhatsApp was planning to become a fully-fledged social network in the future.[..] Such proof that the start-up is planning to enter the acquirer's core market will generally also be difficult to obtain in other cases. Clear plans for doing so will rarely exist when start-ups are being bought up at an early point of their life."

[56]The fact that the incumbent may be willing to pay a higher acquisition price to defend its dominance position should not be a reason to allow that acquisition if there are superior alternatives from the competition point of view. Recall that a similar approach is followed by AAs in case of the so-called "failing firm" mergers. If there exists another route for the failing firm's assets to stay in the market, the failing firm defence would not be accepted.

behaviour on the platform is proper and which one is either not possible or punished. In particular, they may exclude participants who allegedly misbehaved. While this is often in the participants' overall interest, there is room for negligence and abuse.

Clearly, merger control (and competition policy more broadly) is a highly imperfect instrument to deal with these and other threats.[57] Nevertheless, we would subscribe to the view that vigilant merger control can sometimes help to avoid problems (or reduce their severity) that are likely to arise from big tech firms expanding their sphere of control. This does not make merger control a silver bullet, but an enlightened merger control appears to us an important component of a policy on how society should deal with big tech.

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