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Governance and Regulation of Platforms

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Abstract

In this chapter, we discuss how platforms manage the interaction between various users. First, we discuss and exemplify governance decisions by platforms that affect access and interactions of users regarding a platform service. Here, we investigate the choice of price structure and the choice of non-price strategies. We also address the horizontal and vertical scope of these platforms. Second, we consider platform decisions that generate spillovers to other platforms or channels, and we explore private incentives and welfare effects. Third, we discuss the role of government regulation in a broad sense, that is, the laws and regulations that constrain platforms and shape their incentives regarding their governance decisions. Emphasis is given to interventions against anti-competitive conduct and practices that may lead to consumer harm.

Keywords: Platform governance, platform regulation, digital ecosystems, digital markets, competition policy, network effects

JEL-Classiciation: L12, L13, L41, L42, D42, D47, K21, K23, M21

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1. Introduction: Platforms and the management of complex ecosystems

Many market interactions have always relied on the services provided by platforms. Traditionally, second-hand items changed hands thanks to announcements made in the classified ads section of a newspaper or flea markets providing space for sellers to display their wares. Manufacturer products and some services also, in part, relied on shopping malls as physical platforms that allowed brand manufacturers to offer their products in their own or franchised shops, or shops operated by multi-brand retailers. In all these examples, *a platform facilitates interactions in an environment that features network effects*, in the sense that the benefits that platform users enjoy depend on the decisions of other users.

Network effects can be of different types, as illustrated by the example of software platforms. These platforms bring together application developers and end users. End users may benefit from the increased presence of other users, leading to *direct* or *within-group network effects* (for instance, through the exchange of tips or the fixing of bugs). Users may also enjoy a larger number and quality of application developers, leading to positive *cross-group network effects* from app developers to end users. On the other side of the platform, developers may take advantage of a larger number and a more intensive usage of end users, leading to positive cross-group network effects from end users to platform developers. Mutual positive cross-group network effects then generate positive *indirect network effects*. The term "indirect" refers to the fact that end users care indirectly about the participation and usage of other end users because more end users attract more developers, which is beneficial for every end user.[2] Correspondingly, developers also experience positive indirect network effects. The platform manages the interaction among users, taking into account the various network effects that exist among them. If the platform addresses the two different user groups differently, we call the platform two-sided.[3] Network effects may arise because a user cares about the presence and engagement of other users or because other users leave a footprint that matters. The latter may be the result of data in which case network effects are data-enabled (Hagiu and Wright forthcoming). For example, recommender systems lead to such data-enabled network effects when they provide valuable information to users when using data collected from other users (Belleflamme and Peitz 2021, Chapter 2).

Some platforms allow for the interaction of buyers and sellers. Non-digital platforms of this type include trade fairs, flea markets, auction houses, and Yellow Pages. Shopping malls are another example, as they offer retail space to sellers and invite buyers to go shopping. All else being equal, sellers prefer a shopping mall that attracts more buyers and buyers prefer a shopping mall that hosts more sellers. Shopping malls are actively managed with different rental contracts applied to different types of shops: for instance, anchor stores used to attract traffic to a shopping mall and therefore received more favorable rates (or were vertically

[2] The observation that indirect network effects arise from mutual cross-group network effects has already been made in the network effects literature. For instance, in the context of hardware platforms, Katz and Shapiro (1985, p. 424) write that "an agent purchasing a personal computer will be concerned with the number of other agents purchasing similar hardware because the amount and variety of software that will be supplied for use with a given computer will be an increasing function of the number of hardware units that have been sold."

[3] If the platform connects more than two groups and addresses them differently, it is called "multi-sided." This denomination also applies to situations in which a given user can be part of more than one group (for instance, an individual may be active on eBay as both a buyer and a seller).

integrated).[4] While some of these platforms have been around for a long time, platforms as "orchestrators" of market activities have arguably gained more prominence with the rise of the Internet. To enable consumers to choose among a myriad of offerings, horizontal and vertical search engines as well as price search engines, booking portals, online auctions, and e-commerce platforms have become commonplace. As many of these digital platforms are not subject to physical capacity constraints and can quickly scale up their activities, they can swiftly conquer whole countries and thus at least appear to be dominant.

With more and more interactions being facilitated through digital intermediaries and other activities moving into the digital sphere (e.g., music and video streaming as a substitute for music and video made available on physical devices), most of the recent public interest and research activities concern digital platforms. Platforms contribute to solving market failures when they make it possible for users to easily find good matches and when they generate trust among users. In a broad sense, platforms can be seen as reducing transaction costs. Moreover, the value that platforms create for their users tends to grow organically thanks to positive network effects: As more users join a given platform, interacting on this platform becomes more valuable, which contributes to attracting even more users, serving as a self-reinforcing mechanism. For instance, more participation may increase the likelihood of encountering a good match or allow the platform to put mechanisms in place that foster trust (like reputation mechanisms). Yet, platforms usually face the problem that a large network size is difficult to achieve because of a coordination problem among users. Here, the platform can use dynamic price and non-price strategies to address such coordination problems.

In a nutshell, platforms create value by bringing economic agents together and may engage in complex strategies to manage network effects to generate economic value. A for-profit platform that is successful in generating value can then use monetization strategies to appropriate part of the generated value and, possibly, make even higher profits if it can impair users' outside options.

Platforms, and in particular digital platforms, can set rules on how transactions can be enabled and possibly also how contracts are enforced. Thus, *a platform manages or orchestrates interactions between different users*. Part of its activity is to police the digital ecosystem that has formed around the platform. For example, in an e-commerce setting, it may have developed rules on how to deal with sellers that offer counterfeit products or that sell products in a way that does not comply with certain quality standards. This belongs to what can be called the governance of the platform. The platform may also set contractual terms that constrain user behavior outside the platform. Price-parity clauses (often called platform MFNs in the US) are an example of this in a buyer-seller context. Such clauses prevent sellers from offering better terms on a competing platform and/or when dealing directly with buyers. Platforms will have to respect the laws enacted by parliaments and decisions by regulators. Thus, a platform's governance decisions are possibly constrained by regulators' decisions.

Complementary works: This chapter complements several other overviews and surveys. In particular, we draw on the monograph by Belleflamme and Peitz (2021). The following are

[4] Thus, buyers and sellers may also care about the composition of users on the other side of the platform (and consumers may also care about the composition on the same side). Pashigian and Gould (1998) analyzed how shopping malls internalize externalities.

complementary surveys: Belleflamme and Peitz (2018a) give an introduction on platform economics with a particular focus on monopoly pricing; Jullien, Pavan, and Rysman (2021) focus their exposition on a platform's pricing decision covering monopoly and oligopoly settings; Peitz and Reisinger (2016) provide an overview on ad-funded content platforms; Belleflamme and Peitz (2018b) provide a survey on rating and recommender systems, which are integral components of many digital platforms; Jullien and Sand-Zantman (2021) review academic research on competition policy issues around multi-sided platforms. In addition to the economics literature on multi-sided platforms, there exists a related literature in strategic management on platforms (see, e.g., McIntyre et al. 2021).

Organization of the chapter: This chapter contains three sections. In Section 2, we address governance decisions that are aimed at managing interactions on platforms. Here, we first look at a platform's pricing decision and then turn to several non-price decisions. In Section 3, we consider several platform strategies that directly affect competition between platforms or competition with trading outside the platform. In Section 4, we address public policies that impose restrictions on what a platform can do (or even mandate certain behaviors).

2. Governance decisions by platforms

Platforms can be broadly defined as managed marketplaces in which interactions between platform users take place and which typically feature network effects (Belleflamme and Peitz, 2018 and 2021). Prices set by the platform allow the platform to monetize its service; at the same time, the choice of the price structure can be seen as an instance of managing participation and interaction of the platform. We will first take a look at the price structure of a two-sided platform before turning to non-price strategies.

Pricing

To obtain a first understanding of the choice of price structure, we look at one platform in isolation. Such an analysis is of particular relevance if the platform is in a monopoly position vis-à-vis the two user groups it serves. The platform owner offers a service that may have stand-alone value r_i for users of a certain group i and may offer benefits that depend on the usage and participation decision of other users. To fix ideas, suppose that the platform caters to two user groups a and b, and that each user cares about the number of users from the same and/or the other group in a linear fashion. For example, one may set the outside option to zero and write a user's valuation on the platform in an additively separable form with linear network effects; that is

$$v_a = r_a + \alpha_a n_a + \beta_a n_b - A_a \quad (1)$$

for users of group a and

$$v_b = r_b + \alpha_b n_b + \beta_b n_a - A_b \quad (2)$$

for users of group b, where α_i is the strength of the within-group network effects, β_i is the strength of the cross-group network effect, n_i is the size of the participating user group i, and A_i is the access or participation fee charged to users of group i.

For the given network effect parameters α_a, α_b, β_a, and β_b and stand-alone parameters r_a and r_b, the platform can manage participation through its participation fees.[5] This is reflected in the literature focusing on the pricing of access to a platform, starting with Armstrong (2006), in various settings, mostly focusing on cross-group network effects and, thus, assuming that $\alpha_b = \alpha_b = 0$.

For any given access fees, there may exist multiple consumer participation equilibria. Depending on the access fees, there may exist two stable equilibria: one with zero participation in both user groups and the other with positive participation by both user groups. If consumers tend to coordinate on the outside option, the platform owner may then choose an asymmetric price structure, even in a symmetric environment, to make sure that users in the group with the lower price (say group a) will participate. If all users observe the full price structure, users in group b then infer that (many) users in group a participate. This induces many users in group b to join even when they face a higher price. This is an instance in which the platform owner uses an asymmetric price structure to solve the chicken-and-egg problem (also sometimes referred to as the mutual baiting problem). The asymmetric price strategy in response to this problem is called a divide-and-conquer strategy.

If the two user groups are different, a profit-maximizing platform owner is no longer indifferent as to which group to use as bait. When applying a divide-and-conquer strategy, a monopoly platform tends to subsidize the group that exerts the largest cross-group network effect on the other group and monetizes users in the other group (irrespective of the relative size of the two groups).[6] The fear of user miscoordination may also make it more attractive to monetize through transaction fees rather than access fees. With access fees, users may not be confident to find counterparts in the other group. Hence, they may be reluctant to pay a membership fee up front, as they fear not being able to conduct any transaction once subscribed to the platform. If instead the platform resorts to transaction fees, the fear is unwarranted as transaction fees are only paid if an effective transaction takes place.

Suppose instead that the platform does not have to deal with the coordination problem of users; that is, consumers are assumed to coordinate on the participation equilibrium that is most favorable to the platform. To understand the monopolist's pricing incentives, we compare how the price structure chosen by the monopolist differs from the one chosen by a social planner who maximizes total surplus. In the presence of positive cross-group network effects, the welfare maximizing solution features access fees below the marginal cost of serving an additional user. For several reasons, a profit-maximizing platform chooses a price structure that differs from the one that would maximize total surplus, but has some resemblance: the monopoly platform restricts output (market-power distortion), cares about marginal users rather than about average users (Spence distortion), induces different interaction benefits (displacement distortion) and different participation rates (scale distortion) – see Weyl (2010) and Tan and Wright (2018, 2021). Depending on the specifics of

[5] More generally, the valuation of a group-i user ($i \in \{a, b\}$) can be written as a function $v_i = u_i\left(n_i, n_j\right) - A_i$ for $j \neq i$, see below.

[6] For a formal investigation see Belleflamme and Toulemonde (2009); for a summary, see Belleflamme and Peitz (2021, chapter 4). For the use of divide-and-conquer strategies under Bertrand competition between two platforms, see Caillaud and Jullien (2003). Here, the result will be market tipping and the only active firm may not make any profit.

the environment (strengths of the cross-group network effects, costs, and stand-alone benefits), the combined impact of these distortions may lead the monopoly platform to set prices that are below or above the efficient level on either side. However, the monopoly platform will never set prices below the efficient level on both sides.

To analyze how the monopoly platform sets its participation fees, we return to the specific setting developed above. To see how users make their participation decisions, we derive the "demands for participation" for each user group. Because network effects make participation decisions interdependently, demands are derived by solving for the Nash equilibrium of the "participation game" that users play. To see this, suppose for simplicity that, in each group, the value of the outside option is uniformly distributed over some sufficiently large interval. Then, the number of users who decide to participate in group i, n_i, is simply equal to v_i.[7] Setting $v_a = n_a$ and $v_b = n_b$ in equations (1) and (2) above and rearranging terms, we find:

$$(1 - \alpha_a)n_a = r_a + \beta_a n_b - A_a \text{ and } (1 - \alpha_b)n_b = r_b + \beta_b n_a - A_b.$$

We see that participation in one group depends on participation in the other group, and vice versa. The next step consists of solving this system of two equations in n_a and n_b. A useful shorthand notation for the solutions is $n_a(A_a, A_b)$ and $n_b(A_a, A_b)$. It is indeed important to emphasize that participation on each side depends on *both* participation fees. In particular, if the network effect parameters respect some conditions, participation decreases as any fee increases.[8] The intuition is simple. Fewer users decide to participate if they or users in the other group are charged a larger fee. The first effect is common (this is the expression of the Law of Demand). The second effect is peculiar to two-sided platforms, as it follows from the presence of positive cross-group network effects: if a fee increase leads to fewer users participating in, say, group b, then users in group a are less keen to participate as interacting on the platform becomes less valuable.

When choosing its fees, the platform internalizes these effects. Typically, as explained by Armstrong (2006), if users in group a exert a positive cross-group network effect on users in group b, then the platform has an extra incentive to lower the price on side a because attracting more users on side a also allows the platform to raise more revenues on side b (and not just on side a as would be the case in the absence of network effects). Mathematically, if we assume for simplicity that the marginal cost of onboarding a user on the platform is zero, the profit function of the platform can be written as: $\Pi(A_a, A_b) = A_a n_a(A_a, A_b) + A_b n_b(A_a, A_b)$. Taking the first-order derivative with respect to A_a yields:

$$\partial\Pi/\partial A_a = n_a(A_a, A_b) + A_a(\partial n_a/\partial A_a) + A_b(\partial n_b/\partial A_a).$$

In the absence of cross-group network effects, participation on side b would not be affected by changes in the fee set on side a; that is, $\partial n_b/\partial A_a$ would be equal to zero and the third term of the equation would disappear. In contrast, if cross-group network effects are positive, then $\partial n_b/\partial A_a < 0$, meaning that the platform finds it profitable to decrease A_a further. Note that,

[7] A user of group i participates if and only if $v_i \geq X$, where X denotes the user's outside option. Given the uniform distribution of X, the number of users such that $X \leq v_i$ is just equal to v_i.

[8] See Belleflamme and Peitz (forthcoming) for explicit expressions of the demands and the conditions to be imposed on the parameters.

if the two groups are not symmetric, this logic may drive the platform to subsidize the participation of one group of users (that is, to set the price below the marginal cost, which can be implemented, e.g., through cash-backs or in-kind payments). This is likely to be the case when one group exerts a positive cross-group network effect on the other while the other does the opposite, as is often the case when one of the two groups contains advertisers and advertising is considered a nuisance by consumers, who form the second user group. If both groups are symmetrical, the monopoly platform will charge fees above marginal costs for each user group.

The previous reasoning relies on two important conditions. First, the platform must be able to freely set A_a. This is not always the case as platforms may face constraints that prevent them from setting their optimal prices. For instance, below-cost prices may be prohibited or infeasible. Then, a platform may be limited in its ability to internalize cross-group network effects.[9]

The second condition is that users on each side can observe variations in prices on the other side. The previous reasoning indeed relies on the fact that users in group b react to a change in A_a, which supposes that they can observe such a change. This may not be obvious in the case, for instance, of software platforms, which act as intermediates between end-users and application developers (e.g., smartphone operating systems or video game consoles). Although the two groups are linked by mutual positive cross-group network effects, they do not interact directly with one another. This prevents, in particular, end-users from having a clear view of what and how much the platform charges app developers. In such a context, end-users must base their participation decision on some predictions of what the participation level of app developers will be. Since users do not observe the price charged to the other group, the platform is tempted to raise this price too much for its own good – this is an instance of the classic opportunism problem (Hart and Tirole 1990). The platform may then want to devote resources to make prices charged to the other group observable, for instance, through dedicated advertising. Gross of the associated costs, this yields higher profits but also higher surpluses for all users.[10]

Finally, it is also important to stress that the previous reasoning (according to which a platform adjusts its prices to internalize network effects) does not rest on the presence of easily distinguishable groups of users but on the platform's ability to target groups with different prices. Many platforms cater mostly to a single group of users (think, e.g., of social networks and messaging applications) and manage the direct network effects that exist within this group. They may, nevertheless, be able to segment their single audience into subgroups that differ along some characteristic and condition prices on these user characteristics. If so, Belleflamme and Peitz (forthcoming) show that a platform catering to a single – but segmented – audience chooses prices very much like a multi-sided platform.

[9] See Belleflamme and Peitz (2021, Section 5.3.1) for a formal treatment. The zero-price constraint is of high relevance in the case of ad-funded media platforms (including social networks) because often the cross-group network effect exerted by advertisers on consumers is negative (i.e., consumers consider advertising to be a nuisance). For formal models of platform competition with one-sided pricing, see Anderson and Coate (2006) and Anderson and Peitz (2020).

[10] Hagiu and Halaburda (2014) and Belleflamme and Peitz (2019c) study this issue. They also show that competition among platforms may attenuate or reverse the platforms' incentives to advertise non-observed prices.

Our discussion focused on monopoly platforms; we confine ourselves to pointing to some works that address competition between two-sided platforms. Assuming that users are either singlehomers or (potential) multihomers, one can distinguish between three oligopoly settings of two-sided platforms: singlehoming by both groups (as analyzed by Armstrong 2006, Tan and Zhou 2021, and Peitz and Sato 2023), singlehoming by one group and multihoming by the other (Armstrong 2006; Section 6 in Anderson and Peitz 2020) including purely ad-funded platforms (Anderson and Coate 2005; Anderson and Peitz 2020), multihoming by both groups (Bakos and Halaburda 2020). Rochet and Tirole (2003, 2006) characterize the outcome when platforms charge transaction fees and users have different inclinations to use a platform. Teh et al. (2023) consider the setting in which users in both groups first make their participation decision (e.g., merchants decide which payment cards to accept and consumers decide which cards to carry) and then users in one group decide which available option to pick (e.g., each consumer chooses which of the cards to pick that they carry and are accepted by the merchant).

Endogenous strength of network effects on the platform

A platform may become active in multiple ways to affect stand-alone benefits and the strength of the network effects that users on its platform experience. The way users interact with each other determines the strength of the network effects and the platform can often affect this strength through price and non-price instruments.

E-commerce marketplaces, which enable trade between sellers and buyers, are a case in point. The strength of network effects is endogenous and depends on the degree of seller competition (Nocke, Peitz, Stahl, 2007; Hagiu 2009; Belleflamme and Peitz 2019a). To fix ideas, let us take a specific example.[11] Suppose that a number n_s of sellers and a number n_b of buyers join the platform. Sellers propose horizontally differentiated products (which they produce at zero marginal cost) and compete à la Cournot.[12] All buyers have the same set of demand functions for the sellers' products: the inverse demand for product k is given by $p_k = 1 - q_k - \gamma q_{-k}$, where p_k and q_k denote the price and quantity of product k, q_{-k} denotes the sum of the quantities of all the other products, and γ measures the degree of substitutability among the products (with $0 \leq \gamma \leq 1$). Solving for the Nash equilibrium of the Cournot game with n_a sellers, we find the profit for each seller, u_a, and the surplus for each buyer, u_b, gross of any payments to the platform as:

$$u_a(n_a, n_b) = n_b \frac{1}{(2+\gamma(n_a-1))^2} \text{ and } u_b(n_a, n_b) = n_a \frac{1+\gamma(n_a-1)}{2(2+\gamma(n_a-1))^2}.$$

These expressions represent the net gains from trade for any seller and any buyer on the platform. Positive cross-group network effects continue to exist between the two groups ($u_a(n_a, n_b)$ increases in n_b and $u_b(n_a, n_b)$ increases in n_a). However, the strength of network effects is not constant and depends on the number of active sellers n_a. We also see that there are negative within-group network effects in the group of sellers ($u_a(n_a, n_b)$ decreases in n_a because of seller competition). The net gains from trade depend on the parameter γ, which

[11] This is an adaption of Example 1 in Belleflamme and Peitz (2019a).

[12] In the sellers' participation decision, we ignore the integer constraint and treat sellers as atomless.

can be seen as a measure of the intensity of competition among sellers (competition is fiercer for closer substitutes): tougher competition leads to lower profit per buyer for each seller.[13] A monopoly marketplace would want to increase the horizontal differentiation among the products that it lists (by selecting the appropriate sellers, removing the visibility of some sellers, steering consumers to a subset of sellers, or by influencing how buyers perceive the differentiation).

An extreme version of reducing competition between sellers is to grant improved visibility or category exclusivity to one seller. An example is exclusivity for certain category sellers in shopping malls; see the empirical study of exclusivity for burger restaurants in Israeli shopping malls by Ater (2015). Another example is the agreement between Amazon and the brand manufacturer Apple, according to which only Amazon and selected sellers are allowed to sell Apple and Beats products. According to the Italian competition authority, which investigated the case, other sellers were excluded (this finding was contested by Amazon and Apple); such a practice is also investigated by the German Cartel Office. Limiting seller competition by a platform can be a response to platform competition and explain the coexistence of profitable non-differentiated platforms (Karle, Peitz, and Reisinger 2020).

A more general approach to analyzing a platform's non-price strategy and its effects on the strength of network effects is provided by Teh (2022) as well as Choi and Jeon (2023). The platform may take some, possibly costly, action that affects $\alpha_a, \alpha_b, \beta_a$, and/or β_b in equations (1) and (2) as well as stand-alone benefits. For example, in an e-commerce setting in which a platform charges a mix of participation fees and ad valorem transaction fees and each seller is a monopolist in its product category, with linear demand $1 - p$ and zero marginal costs of production, the profit-maximizing seller makes a per-buyer profit of $\beta_a = 1/4$ and each consumer obtains a per-seller surplus of $\beta_b = 1/8$ under uniform pricing, while the corresponding values under perfect price discrimination would be $\beta_a = 1/2$ and $\beta_b = 0$ (gross of any fees). Thus, by disclosing consumer valuations to sellers, the platform affects the strength of network effects.

Price competition between sellers can be affected through other means by the platform. For instance, in de Cornière (2016), a monopoly platform with a fixed advertising fee can reduce the accuracy of targeting. Doing so induces buyers to search less, which deteriorates the match quality and relaxes competition between sellers. Another instance is Karle and Peitz (2017) in which a platform taxes seller profits and can enlarge consumers' consideration set. With expectation-based loss averse consumers, this manipulates consumers' reference points and thereby relaxes competition.

Several works have looked at other environments in which a platform (or competing platforms) makes decisions that manage the interaction between the different user groups and thereby affect the strength of network effects. Dinerstein et al. (2018) theoretically and empirically analyze a platform's decision on how much to steer consumers to their most desired product taking into account the sellers' response in their pricing decision. Johnson, Rhodes, and Wildenbeest (forthcoming) consider a platform's demand-steering rules that reward sellers

[13] If products become closer substitutes, surplus per seller for each buyer is reduced (that is, $u(n_b, n_s)/n_s$ decreases in γ). While consumers benefit from lower product prices (because competition intensifies), they suffer from the exogenous reduction in product variety and, as it turns out, the latter effect dominates the former.

when they cut prices. A platform may decide on delisting or demoting low-quality sellers or to delist IP-infringing sellers (Casner 2020; Hua and Spier 2023; Jeon, Lefouili, and Madio 2022). Short of delisting, a platform may design its rating and recommendation systems such that inferior sellers are more easily identified or become less visible (Belleflamme and Peitz 2018b). It may introduce deceptive features (Johnen and Somogyi 2022) or engage in content moderation (Liu et al. 2022; Madio and Quinn 2023). Instead of disclosing consumer valuations to sellers, it may give consumers the possibility to voluntarily disclose some information on their valuation to consumers. Here, the platform chooses a disclosure technology that affects the strength of network effects (Gambato and Peitz 2023, building on Ali, Lewis, and Vasserman 2023). In these environments one can study whether and to which extent platform incentives are aligned with buyer and/or seller incentives (and possibly distinguish between different types of sellers or buyers), possibly depending on the price instruments available to the platform. Some of the non-price strategies require investments by the platform, and the platform will invest if the marginal cost is less than the extra benefit that is extracted by the platform.

Depending on the type of non-price strategy and the environment in which the platform operates, either one or both groups benefit. In the example about the platform providing consumer information to sellers that enables them to perfectly price discriminate, such a non-price strategy benefits sellers and harms consumers. By contrast, if sellers offer an experience good and, thus, are subject to a moral hazard problem resulting in low product quality, a non-manipulated rating system can be an important source of information for subsequent users (e.g., they learn about the quality of the rated hotels on a hotel booking platform). If sellers choose high quality in response to the rating system, the expected gains from trade rise and cross-group network effects are likely to be stronger for both user groups (consumers and sellers).[14]

The platform within its broader ecosystem

A platform may take a central position in an ecosystem and decide on how much to extend its reach, both in terms of its horizontal scope (e.g., which product categories to cover and which consumer segments to address) as well as its vertical scope (which added service to integrate or offer through complementors).

Digital platforms can often (but not always) easily scale their business to other products and consumer segments. Scope economies are favorable for increasing the horizontal scope. For example, Amazon's investments in its logistics network allows it to easily add new product categories with FBA offers (fulfilled by Amazon) to its marketplace. In general, certain assets may be used broadly (e.g., the brand and the associated consumer trust, certain software components, or AI capabilities). Also favorable are data-enabled network effects across different services or consumer segments (de Cornière and Taylor 2020) and consumer benefits from one-stop shopping. Finally, a platform may strategically use bundling and tying to increase its scope; we provide some more detail on this issue in the next section.

[14] For further examples of the impact of a platform's non-price strategy on network effects, see Section 4.3 in Belleflamme and Peitz (2021).

Regarding the vertical scope, an e-commerce platform may provide warranties, insurance, and integrated payments. It may offer warehousing services and provide delivery services. It may fully vertically integrate some activities. For example, in ad tech, Google and Facebook have (partially) vertically integrated and are active in multiple layers of the value chain.

A platform (e.g., a hotel booking platform) may face the threat that some users meet on its marketplace but complete the transaction off the platform. For a platform that raises its revenues through transactions this constitutes a revenue loss – this phenomenon is called platform leakage. Here, the platform provides a showrooming service. Platforms can combat leakage through a number of measures: they may make it more difficult for users to transact off the platform (e.g., on AirBnB by hiding the identity and contact information of the transaction partner), by delisting or demoting sellers that use the platform as a showrooming service, by removing consumers' incentives to transact off the platform through price-parity clauses (e.g., on hotel booking platforms such as Booking; see Hunold, Kesler, and Laitenberger 2020),[15] and/or by offering additional benefits for completing a transaction on the platform (e.g., on Amazon Marketplace through superior logistics or payment options). The platform may also adjust its monetization model and rely less on transaction fees and more on advertising or referral fees.[16]

A platform may not fully vertically integrate certain product or services, but operate in dual mode; that is, the platform admits third party providers, but also offers services or products itself.[17] Consider a setting in which a platform charges sellers for the transactions on a platform. A possible defence for the practice of introducing first-party offers is that a platform may want to provide an anchor for retail prices of third-party sellers. This is of particular relevance in markets with little competition between third-party sellers.[18] In this case, the platform as a guardian of the ecosystem may be worried about consumers receiving a bad deal and therefore introduce a first-party product to stimulate competition. This may be a more attractive option for the platform than lowering fees charged to sellers; in particular, if such fee reductions are not fully passed through to consumers. In such a case, a platform is particularly inclined to introduce those first-party offers for which it has a cost or quality advantage over third-party sellers.

In Anderson and Bedre-Defolie (forthcoming), a monopoly firm can operate as a pure retailer, as a platform running a marketplace with third-party sellers, or as a platform in dual mode running a marketplace on which it also sells products as a retailer itself. A platform in dual mode sets the retail price of its own product and a percentage transaction fee; third-party sellers observe these prices and decide whether to enter and, if so, set their retail prices; finally, buyers make purchasing decisions. In that setting, prohibiting the dual mode increases consumer surplus if and only if the prohibition leads to a pure marketplace.[19]

[15] The competitive effects of price-parity clauses are discussed in Section 3.

[16] For a formal analysis of a monopoly platform's responses to the leakage problem, see Hagiu and Wright (2023).

[17] The exposition on the dual mode is taken partly verbatim from Peitz (2022b).

[18] Take as an extreme case a situation of full seller collusion and step demand, which implies that sellers will charge the monopoly price that is independent of the level of the fee charged by the platform.

[19] For further theoretical work, see Etro (2023a). Crawford et al. (2022) empirically assess the effect of Amazon's retail entry competing against third parties offering the same product. They find that entry is correlated with high growth and a low degree of competition. Overall, they read their findings as Amazon internalizing externalities,

If the marketplace includes product categories in which innovative sellers may appear, the marketplace helps consumers in the discovery process and limits the market power of an innovative seller. According to Hagiu, Teh, and Wright (2022), this implies that the dual mode always gives higher consumer welfare than the pure marketplace. Furthermore, a ban on the dual mode never increases consumer welfare.[20]

When operating in the dual mode, the platform may use information on the success of third-party sellers to decide which product category to enter.[21] Some research looks at the dynamic effects this might have. First, a third party may anticipate the platform's imitation decision in the case of high demand and hide information related to demand (Jiang et al. 2011). Alternatively, third-party sellers may reduce investment[22] or opt for product categories for which it is known that demand is low so that the risk of the platform entering with a first-party product is also low. To address the concern of underinvestment and distorted entry by third-party sellers because of the imitation threat, a possible remedy is to ban the platform (or at least its first-party division) from having access to any private information generated by the third-party seller (Hagiu, Teh, and Wright 2022). However, a platform with access to this information may operate more efficiently and just banning the first-party division from accessing this information may be difficult to enforce. Another possible remedy is to prohibit the platform from entering new product categories with first-party products for a certain amount of time (Madsen and Vellodi forthcoming).

Consumer steering and self-preferencing

Platforms may steer consumers to particular offers.[23] Product recommendations and rating information play an important role in the consumer experience and, when platforms compete, the platform with the recommendation or ratings system that better serves consumer interests may have the edge over its competitors. However, platforms with market power may make product recommendations or modify the rating system to serve their own interests, which may well be different from consumers' best interests. Several contributions provide formal arguments that platforms as pure intermediaries may make recommendations that are not in the best interest of consumers.[24] This is most easily seen when the platform does not charge users directly and only extracts some of the surplus generated by sellers. In the context of search engines, this was noted by Brin and Page in 1998: "*we expect that advertising funded search engines will be inherently biased towards the advertisers and away from the needs of*

which makes the platform more attractive to consumers. A different market expansion effect can arise if a platform invites entry of successful offline brands (Jin et al. 2021).

[20] Other contributions include Hagiu and Spulber (2013) and Etro (2021a). Etro (2021b) and Jeon and Rey (2021) investigate how the platform's monetization model affects its incentives to enter with first-party content and the incentives of third-party developers.

[21] Platforms such as Amazon marketplace obtain information on which products or product categories are particularly successful. Zhu and Liu (2018) provide empirical evidence that Amazon is more likely to enter as a first-party seller into more-successful product spaces.

[22] For some evidence in the mobile app market, see Wen and Zhu (2019).

[23] The exposition is based on Peitz (2022b) and partly uses material verbatim. For surveys on self-preferencing, see Kittaka, Sato, and Zennyo (2023) as well as Etro (2023b).

[24] For work in the context of search engines, see Hagiu and Jullien (2011, 2014) as well as de Cornière and Taylor (2014). More broadly, see Heidhues et al. (2023), Lee (2021), and Peitz and Sobolev (2022). For overviews that address the incentives of a platform regarding which recommendations to give, see Belleflamme and Peitz (2018b, 2021).

the consumers" (Brin and Page, 2012, p. 3832). Furthermore, sellers may differ in their ability to extract rents from consumers (who will be active on the platform in any case) and therefore a platform may favor those sellers that are better at extracting such a surplus. Similarly, some sellers may operate on different terms than others, which provides incentives to the platform to engage in biased recommendations. For example, Spotify is a platform that strongly affects consumers' streaming behavior through its popular playlists, some of them algorithmic, others curated (Aguiar and Waldfogel 2021). Aguiar, Waldfogel, and Waldfogel (2021) provide evidence that Spotify biases recommendations against major labels, which may be the response to the fact that major labels ask for higher royalties.

If a platform operates in dual mode, the platform internalizes the profits it makes from its vertically integrated activities and may engage in self-preferencing; that is, it steers consumers to first-party products or services when this is not in consumers' best interest. For example, if a consumer could get a lower price for the same service quality from a third-party seller, then steering consumers towards a first-party product constitutes self-preferencing. The issue gets more complicated when products or services are differentiated, and consumers have different tastes about those products or services. For example, if some consumers have a strong taste for quick delivery, while others do not, it becomes difficult to assess when actual recommendations qualify as self-preferencing. Theoretical work has identified instances in which a platform with market power decides to engage in self-preferencing. For instance, a platform operating in dual mode may engage in self-preferencing to address the problem of bypass that otherwise limits the fees it can charge third parties. Hagiu et al. (2022) show that self-preferencing can then result in higher fees and consumer prices.[25]

Recent empirical work has identified instances of self-preferencing (broadly defined) and explored counterfactuals. Chen and Tsai (forthcoming) investigate Amazon's recommendations through its 'Frequently Bought Together' algorithm. Products are sold by Amazon as a retailer, by sellers as part of the 'Fulfilment by Amazon' (FBA) program, and non-FBA sellers. The authors conclude that the steering via Amazon's FBT algorithm is driven by seller identity rather than consumer preference. Lee and Musolff (2023) evaluate the effect of Amazon's use of the buy box on consumer welfare using high-frequency data with the help of a structural model and find that the way Amazon preferentially treats first-party products increases consumer welfare because, everything else given, consumers appear to prefer the product sold by Amazon instead of a third-party seller. With endogenous seller entry and exit, they find that the impact on consumer welfare is negligible but remains positive. Lam (2023) considers consumer searches that are guided by the platform's decision on how to position different products in a product category and proposes a setting with heterogeneous consumers who sequentially search for differentiated products. Using Amazon data in the Home & Kitchen category, he estimates his model under the assumption that the ad valorem fee does not change. If Amazon's position advantage is removed, profits are shifted from Amazon to third-party sellers. Such neutral positioning is shown to reduce the value of consumer search and, as a result, consumers are worse off after such an intervention. This means that Amazon's steering incentives are aligned with consumers' interests.

[25] Other theory contributions on self-preferencing include Bourreau and Gaudin (2022), de Cornière and Taylor (2014, 2019), Padilla et al. (2022), and Zennyo (2022).

Self-preferencing is also an issue in mobile app stores. Teng (2022) finds evidence of self-preferencing in Apple's App Store. Self-preferencing affects consumer search and developers' investment in app quality. In the counterfactual that removes self-preferencing, independent apps would increase investments. Overall, according to her estimates, such an intervention increases consumer and developer welfare.

3. Platform decisions with cross-platform spillovers

Platforms may impose contractual obligations on some of the users or make decisions that directly affect competition between platforms or competition with an outside option. We look at three such practices – platform exclusivity, price parity clauses, bundling and tying – and assess the competitive and consumer surplus effects of such practices.

Platform exclusivity

A platform may want to make some users (or their products and services) exclusive.[26] In some environments this may serve as a facilitating device and lead to higher prices. Yet, in other environments, there may be efficiencies associated with granting platform exclusivity. What is more, exclusivity may affect incumbent and entrant platforms differentially – it may serve as an entry deterrent or, conversely, benefit an entrant platform.

Platform exclusivity can be addressed in standard models of platform competition (such as the one by Armstrong 2006). By imposing exclusivity agreements upon a user group, a platform can force them to singlehome.[27] A case in point is the so-called "radius clause," whereby shopping malls prevent retail chains from opening another outlet in a competing shopping mall located within an agreed radius. Also, the ride-hailing companies Uber and Lyft have designed their application to make it difficult, if not impossible, for drivers to multihome (i.e., to compare ride offers from the two companies). However, third-party applications now exist that present offers from Uber and Lyft to drivers on a single screen, which facilitates multihoming.

If at least a fraction of users in one group are exclusives, this has the potential to increase the differentiation between platforms in the eyes of the users in the other group and this may reduce the pressure on prices for the latter group, but it also affects the pricing incentives regarding the former. Even if users care only about the number of users in the other group but not its composition, there are equilibrium effects to consider. In a buyer-seller context, consider a setting with exogenously differentiated duopoly platforms in which buyers always singlehome, whereas sellers are forced to singlehome under exclusivity but can multihome otherwise. Without exclusivity, the environment has been called a competitive bottleneck (Armstrong 2006) because each platform provides monopoly access to its set of consumers and will therefore operate as a monopolist on the seller side. Under some conditions (but not always), this leads to a price structure that is favorable to buyers but unfavorable to sellers

[26] Exclusive content may serve as a substitute to first-party content and the incentives to sign exclusivity contracts may depend on the presence of first-party content.

[27] To be precise, this holds under platform duopoly. If more than two platforms are active and one platform imposes exclusivity, this would not restrict users from multihoming on the other platforms.

compared to the setting in which sellers must sign exclusivity contracts to be admitted to the platform.

Endogenizing the choice of exclusivity (in a setting with linear demand), whenever platforms benefit from imposing exclusivity, doing so may benefit or hurt sellers depending on the model parameters, but always hurts buyers (Belleflamme and Peitz 2019b). Another important observation is that the use of exclusivity contracts in one group changes the incentives of users in the other group to become multihomers (Armstrong and Wright 2007).

Exclusive content may be offered by "large" content providers such that one or several content providers may not be atomless (in contrast to the settings described above) and platforms bid for such exclusive content. Such a strategic content provider partly internalizes the impact of its own price on platform demand and, depending on the characteristics of the content, the content provider signs an exclusive agreement or multihomes (Hagiu and Lee 2011). Focusing on a single strategic content provider, this content tends to be exclusive if platform competition is intense, as this allows the platform with the exclusive content to attract a large number of consumers (which implies that exclusivity does not sacrifices much of the network size) and the strategic content provider extracts surplus through an auction with a reserve price (Carroni, Madio, and Shekhar 2023).

To address the entry deterrence argument, following Doganoglu and Wright (2010), consider an environment in which an incumbent platform can sign up some users upfront and, thus, deprive a more-efficient entrant platform from getting access to these users. In the case of two-sided platforms, the incumbent platform can sign exclusivity contracts prior to entry. Here, the incumbent can divide the interests of sellers and consumers by offering attractive conditions to sellers such that they never have an incentive to reject the offer. Knowing this, consumers will join the incumbent subsequently. With homogeneous consumers, the incumbent platform extracts the full consumer surplus and using exclusivity preserves the incumbent platform's position. If the incumbent could not require exclusivity in the contract, sellers would be able to multihome and the incumbent platform would not be in a position to profitably deter the entrant platform. Thus, exclusivity contracts deter a more-efficient entrant to enter.

On the contrary, exclusive content (which may be vertically integrated) may also work as an effective entry strategy; think of the decision by Disney to remove content on video streaming platforms such as Netflix and launch its own streaming platform, Disney+. Less recently, Lee (2013) analyzed exclusive content in the US video game industry (2000-2005). According to the estimates of their structural model, consumers would have benefitted if game platforms (console makers) had not been allowed to own or exclusively contract content, but entrant platforms would have been worse off because more high-quality content would have been available on the incumbent platform due to its larger installed base.

In contrast to platforms striving for exclusive content or services, platforms may make their use compatible and thereby remove platform-specific network effects. As Doganoglu and Wright (2006) show, (symmetric) firms have a socially excessive interest in providing two-way

compatibility.[28] Note that sometimes a single firm may decide to facilitate content becoming available on other platforms (one-way compatibility). A platform may thus decide to be horizontally open (e.g., by publishing its own interface specifications) and let its base of content or services be accessed from users attached to a competing platform (through converters); for a discussion, see Farrell and Simcoe (2012).

Price parity clauses

Price parity clauses stipulate that sellers on a platform cannot set higher retail prices on this platform than in a certain set of alternative sales channels.[29] This may include certain direct sales channels or other indirect sales channels provided by competing platforms. So-called wide price parity clauses stipulate that sellers must not offer a lower price through any other channel (including direct and indirect channels), while narrow price parity clauses stipulate that sellers must not offer a lower price in the direct sales channel but are allowed to set lower prices on other platforms. Wide price parity clauses are often seen as anti-competitive, while there is substantial disagreement about the likely effects of narrow price parity clauses.[30]

Price parity clauses have been imposed by several large digital platforms in the past. This includes hotel booking platforms such as Booking, which led to abuse cases in several jurisdictions in the 2010s. It also includes Amazon with its general pricing rule. Amazon addressed the sellers on its platform as follows: "you must always ensure that the item price and total price of an item you list on Amazon.com are at or below the item price and total price at which you offer and/or sell the item via any other online sales channel." After the competition authorities initiated investigations, Amazon removed price parity clauses in Europe in 2013,[31] but continued to impose the clause in the U.S. In 2019, it then appeared to also remove the clause in the U.S.; however, the clause was replaced by a similar "fair pricing policy."[32] Yet another example is that Apple obliged publishers to set e-book prices in Apple's iBookstore at the lowest retail price available in the market.

The basic argument as to why price parity clauses are anti-competitive goes as follows. Consider a single platform that charges fees on the seller side and competes against the direct sales channel. If the platform obliges sellers on its platforms to not offer a lower price in the direct channel, consumers are not inclined to use the direct channel if the platform offers some convenience benefit. The platform will then set a high fee and extract a large fraction of seller

[28] Doganoglu and Wright (2006) also study the interaction between multihoming and compatibility. For a recent contribution on the potential pitfalls of mandated interoperability, see Bourreau and Krämer (2023).
[29] The exposition follows (mostly verbatim) Peitz (2022).
[30] Practitioners and academics often call price parity clauses most-favored-customer clauses or "MFNs" (standing for most-favored-nation clauses), which can be seen as unfortunate and is possibly misleading. Most-favored-customer clauses traditionally stipulate that a seller cannot set different prices to different consumers or different prices over time. Price parity clauses do not contain such restrictions but impose restrictions concerning prices faced by a given consumer across different distribution channels.
[31] See press release of the Bundeskartellamt of November 26, 2013 "Amazon abandons price parity clauses for good" https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Meldungen%20News%20Karussell/26_11_2013_Amazon.html.
[32] In May 2021, the District of Columbia filed a complaint against Amazon at the Superior Court of the District of Columbia that contains more details on the contractual clauses imposed by Amazon.

profits. If price parity clauses were prohibited the platform's fee setting would be constrained because the sellers would serve consumers at a low price in the direct channel if the fee were too high. This is a powerful argument against any price parity clauses.

If there are competing platforms, the argument applies to wide price parity clauses. Since sellers' retail prices must be the same across the competing platforms under wide price parity, a seller cannot serve more consumers on a platform that lowers its fee. This reduces the incentive of a platform to offer a reduced fee. This means that wide price parity clauses can be used as a facilitating device to soften platform competition. At the same time, consumers have little reason to try out new look-alike platforms and, thus, barriers to entry are higher with such clauses being in place.

One possible limitation of the above reasoning is that platform quality has been treated as exogenous. With price parity in place, platforms may have a strong incentive to increase the service quality offered to consumers to attract them to their platform. However, economic theory predicts that, accounting for such costly quality provision, will lead to socially excessive investments in service quality (which benefits consumers), but the net effect of price parity clauses is that consumers will be harmed because the consumer surplus gain from higher service quality is more than offset by higher retail prices (Edelman and Wright 2015).

Another qualification is that the above reasoning abstracted from the possibility that, absent price parity, consumers may use the platform to obtain valuable information, but with lower retail prices elsewhere, they will leave the platform and finalize the transaction elsewhere. Platforms would then receive no compensation for such showrooming services, which weakens their incentive to provide such a useful service to consumers. Price parity clauses make seller free-riding unlikely since consumers cannot find lower prices elsewhere.

Absent price parity, consumers search on the platform and will not transact via the platform if the price differential between the price on the platform and the price on the direct distribution channel exceeds the convenience benefit from transacting on the platform. Sellers may want to set low prices in the direct channel that induce consumers to switch. This constrains the platform's fee setting since the platform will want to avoid free-riding. As shown by Wang and Wright (2020), when price parity clauses are prohibited, consumers are better off if the platform remains viable.

With competing platforms and showrooming, wide price parity clauses continue to decrease consumer welfare, while results regarding narrow price parity clauses are less clear-cut: if narrow price parity is needed for the viability of platforms and platform competition is sufficiently intense, narrow price parity clauses are in the interest of consumers (Wang and Wright 2020). What is more, even in the case of a monopoly platform, price parity can be profitable and, at the same time, increase consumer welfare (see Liu, Niu, and White 2021; Peitz and Sobolev 2023).

Bundling and tying

Good examples of bundled offers are cable-tv bundles as well as subscription services by streaming platforms (such as Netflix). Amazon with its Prime membership is another example

of a bundling strategy. Bundling is particularly attractive for a firm offering digital products since the marginal cost is typically negligible. Thus, bundling can be used for price discrimination purposes, but also as a way to offer multiple products in a more convenient way to consumers. However, bundling may not be in the interest of consumers when it is used as a facilitating device or as a deterrence device. What is more, theories of harm based on dynamic leverage have been relevant in some competition cases. While bundling is a common practice, it has some distinguishing features in the context of platforms.

Amelio and Jullien (2012) point to the fact that bundling can relax the zero-price constraint that applies if the platform cannot subsidize a user group. Suppose that there is a monopoly platform that caters to two user groups that are connected through cross-group network effects. Furthermore, suppose that in this setting the zero-price constraint is binding such that the monopoly platform would find it profitable, but is not allowed, to subsidize one of the user groups. Consider the option of the platform to sell another product that generates positive gains from trade for one of the two user groups and users in this group have the same willingness to pay for this product. Through bundling, the platform can then relax the zero-price constraint and implicitly make a subsidy. When the platform sells the bundle and the second product separately, in the profit-maximizing outcome, platform makes strictly higher profits than absent bundling and both user groups are better off (Amelio and Jullien 2012).

Network effects can lead to anti-competitive bundling or tying. Two arguments have been developed in which anti-competitive bundling relies on network effects. In Choi, Jeon, and Whinston (2023), a firm is a monopolist in the primary market (where consumers have heterogeneous valuations for this product) and competes against a competitor in a second market in which consumers experience positive direct network effects. Under independent pricing, the firm would set the monopoly price in the primary market and consumers would receive the consumer surplus associated with monopoly pricing. As Choi, Jeon, and Whinston (2023) explain, when the firm bundles its two products, consumers with high valuations in the primary market may continue to purchase the bundle even if other consumers were to buy from the competitor in the second market. The existence of such high-valuation consumers guarantees a minimum market share for the firm in the second market. Because of network effects in the second market, this installed-base advantage may induce low-valuation consumers to buy the bundle. This may lead to tipping in the second market in favor of the firm offering the bundle even though the competitor is more efficient in the second market.

Fumagalli and Motta (2020) also consider tying between a primary market in which an incumbent firm starts as a monopolist and a complementary market. The incumbent firm is willing to sacrifice current profits when tying in order to exclude a more efficient rival from a complementary market by depriving it of the critical user size that it needs to be successful. This leads to a favorable position for the incumbent when a more-efficient rival enters the primary market and allows it to extract part of the rival's efficiency rents. In this argument, the presence of non-negative price constraints is crucial for exclusion.

Choi and Jeon (2023) show that bundling can be anti-competitive when firms operate as platforms and cannot set negative prices to consumers. They consider the interplay between two markets, one monopoly product market and another competitive product market that is ad-funded. Their argument goes as follows. Suppose that a monopoly firm attracts buyers by

offering a service at some price. Suppose also that there is another service in which the firm competes against a more-efficient competitor who offers its service at some non-negative price to consumers and, on top, monetizes on the advertiser side (for simplicity assume that consumers do not mind advertising combined with content from this second category). The competitor is more efficient in the sense that it offers higher service quality to buyers and incurs the same cost.

Since firms cannot subsidize consumers, the more-efficient competitor is constrained in its ability to offer a better deal to consumers in response to the offer by the firm that is less efficient in providing the second service. If access to the two types of content is sold separately, this is not an issue and the monopoly intermediary sells the first service at the monopoly price, while the more-efficient competitor for the second service sells in the other market at a price that reflects consumers' willingness to pay for higher content quality and, in addition, makes positive ad revenues. The former can offer a better deal to consumers for the second type of content because it can offer the bundle of both types of content at a lower price. It also has the incentive to do so if it is not too much at a disadvantage compared to its more-efficient competitor. Since consumers would like to have both services, they choose the bundle if the bundled price is not too high (assuming that consumers singlehome). In return, the firm offering the bundle attracts all consumers and can monopolize the advertising market that comes with the second service. The point is that because of advertising opportunities there is a positive surplus on the table in the market for the second service. If the more-efficient competitor lacks instruments to offer a higher surplus to consumers, it is vulnerable to losing out to the less-efficient firm that can offer a bundle.

4. Public regulation

Legislators may endow regulators with powers to restrict the behavior of (certain types of) digital platforms or intervene directly. In addition, general competition law may provide the basis for intervention by competition authorities if digital platforms engage in anti-competitive conduct or if platforms engage in anti-competitive merger activities. Also on the table may be the possibility for competition authorities or regulators to impose structural measures such as forced divestitures. Apart from the regulation of digital platforms and general competition law, other areas of laws may be applicable as well: tort law, consumer protection law (including privacy), IP law (counterfeit, copyright violations), laws against unfair trade practices, telecom and media regulation. The EU legislator not only grants intervention possibilities under general competition law (articles 101 and 102 TFEU and competencies in merger control) but also introduced specific regulations that address a number of concerns (that are to be enforced by the EU member states or EU institutions). Most notable are the platform-to-business regulation (P2B regulation), the package of Digital Services Act (DSA) and Digital Markets Act (DMA) that came into force in 2022. The P2B regulation establishes rules to be followed by digital platforms in their dealings with smaller businesses and sellers; the DSA, which updates the eEcommerce Directive from the year 2000, imposes differential obligations on platforms regarding illegal content, transparent advertising, and disinformation; the DMA imposes obligations and prohibitions on a few “gatekeeper platforms” regarding their “core platform services” (e.g., Google Search and Google Maps).

Possible interventions by legislators, competition authorities, and regulatory authorities include forced divestitures and the prohibition of a proposed merger, prohibition of certain price or non-price strategies (or the obligation imposed on platforms to take certain actions), fines for violations, and liability rules.

Merger control

From an economic point of view, forced divestitures are the mirror image of blocking a merger, as they dissolve an integrated firm, while a merger would generate an integrated firm. Nevertheless, competition law treats these two types of interventions quite differently since a forced divestiture is an intervention that happens ex post and is more drastic, insofar as it may force the firm to make costly adjustments. Digital platforms have been very active in merger activities – this applies to Google, Amazon, Facebook, Apple, and Microsoft (GAFAM) but also to other digital platforms.[33] Empirical efforts on GAFAM mergers have focused on establishing some facts about the nature of these mergers and the effects of merger policy (Affeldt and Keser 2021a, 2021b, Argentesi et al. 2021, Ederer and Pellegrino 2023, Eisfeld 2022, Gautier and Lamesh 2022, Gugler, Szücs, and Wohak 2023, Jin, Leccese, and Wagman 2023a, 2023b, Prado and Bauer 2022).

In the presence of network effects, an increase in market concentration may be beneficial for consumers. At the same time, a merger makes market tipping more likely and monopolization is often not beneficial for consumers. Horizontal mergers between multi-sided platforms tend to be difficult to evaluate, which makes it harder to obtain clear-cut theoretical predictions and empirical results; the Cournot approach developed by Correia-da-Silva et al. (2019) may be useful in this respect.

Regarding the role of network effects, if the consumer base is important up to a certain level, the most profitable merger may lead to consumer harm according to the following argument: When firms are able to combine the installed consumer base through a horizontal merger and there are several firms willing to bid for a takeover target, the acquisition by the highest bidder may lead to a worse outcome from a consumer welfare perspective than if the acquisition were made by a firm with a lower bid. The reason is that the firm with the lower bid would achieve critical mass with the merger, while the firm with the higher bid already has, but deprives the competitor of it (Motta and Peitz 2021).[34]

Horizontal mergers may be clearly anticompetitive if more-efficient competitors are acquired quickly and there is competition for the market in the sense that the entering more-efficient competitor would attract all unaffiliated consumers. Following Katz (2021), one way to think about this is that loyal consumers stay with the incumbent firm until they retire from the market, while flexible consumers go for the better offer. A potential entrant must then be confident that it would make the better offer to have an incentive to enter. After entry it will first attract flexible consumers outcompeting the incumbent, while the incumbent stays on for a while as long as it can profitably sell to the loyal consumers. Eventually, the incumbent leaves the market and the former entrant becomes the new incumbent, which will enjoy monopoly

[33] The following exposition draws partly verbatim from Peitz (2023).

[34] The argument also applies when merging firms hoard certain assets or capabilities and these assets or capabilities are scarce overall.

profits as long as no other firm enters. When the incumbent is still around, it constrains the entrant's pricing power. When the innovation process is exogenous, a merger between the incumbent and the firm that is about to enter removes the competitive constraint, which is harmful to consumers and society.

The expansion of an ecosystem through vertical or conglomerate mergers constitutes an envelopment strategy (Eisenmann, Parker, and Van Alstyne 2011). One concern may be that a vertical or conglomerate merger might diminish competition or raise other competition concerns within an ecosystem. However, if this ecosystem is relatively small and engaged in competition with a more popular ecosystem, the merger could potentially bolster the position of this ecosystem in relation to its competitor, thus promoting competitiveness.[35]

This argument can be reversed when the ecosystem under consideration already holds a strong and possibly entrenched position. In such cases, further strengthening the ecosystem might reduce overall competition between ecosystems. This may be of particular relevance in cases (in which the merger expands an ecosystem or the gatekeeper's control thereof) such that the gatekeeper gains a data advantage. This data advantage could also make it more challenging for outsiders to challenge the ecosystem. Relatedly, a gatekeeper that operates a multi-sided platform on which user data are monetized may be able and have an incentive to envelop another activity by tying its privacy policies. Such a strategy relies on overlapping users and monetization of user data also for the activity that is subject to envelopment (Condorelli and Padilla 2020, forthcoming).

"Regulating" conduct under competition law or specific regulation

A competition authority may investigate a particular practice and run a case against an individual company for abusing its market power. The practice may be prohibited if it is anticompetitive. Over the years, several digital platforms have been subject to antitrust scrutiny and the underlying theory of harm put forward by the authority has in some cases been based on certain features of the digital platform. Also, as explained in the previous two sections, academic economists have developed novel theories of harm in a platform setting.

Competition practice often includes market definition and a market power assessment as the starting point to evaluate a certain practice. These can be particularly challenging in a platform context (Katz and Sallet 2018; Franck and Peitz 2021a, 2023).

An alternative to the application of general competition law is sector-specific regulation targeted towards certain platforms. This may take the form of a separate regulation (as, in the EU, for telco operators, which provide communication platforms, and, with the DMA, for certain digital platforms). Instead, general competition law may be supplemented by specific provisions that are applicable only to certain digital platforms (as in Germany with Section 19a of the German Competition Act, see Franck and Peitz 2021b).

Telco regulation may contain elements that restrict the practices of internet service providers (ISP) as platforms. For example, net neutrality obligations restrict the price and non-price

[35] This argument was made by Compass Lexecon consulting for the acquiring party in the NVIDIA/Arm merger and led to the formal analysis in Bisceglia et al. (2022).

strategy of ISPs regarding digital content. Regarding pricing, the ISP may want to monetize on the consumer and content provider side by charging a subscription fee to consumers and a termination fee to content providers for the delivery of their content. Net neutrality regulation can rule out such two-sided pricing and require that (i) the ISP provide the same service to all content providers and users, and (ii) only consumers but not content providers be allowed to be charged – Greenstein, Peitz and Valletti (2016) provide a guide to the net neutrality debate.

The DMA contains a list of prohibitions and obligations (in Articles 5 to 7) applied to designated "gatekeeper platforms" in relation to their "core platform services." In addition, it contains an anticircumvention prohibition (Article 13) and the possibility to add further obligations and prohibitions in the future. The DMA is enforced by the European Commission. Among the prohibitions and obligations figure the prohibition of the use of any price-parity clauses,[36] self-preferencing, and bundling. The DMA also contains interoperability requirements and provisions that address data imbalances between gatekeeper platform and sellers of third-party services. Regarding the former, Article 7 is noteworthy as it provides very detailed regulation with respect to interoperability of messaging services ("number-independent interpersonal communication services") at the request of competitors to those companies for which messaging is a core platform service.

Public governance, tort law, and other regulations

Digital platforms may be subject to regulations that are motivated by concerns outside the competition realm. Social media platforms may be subjected to content moderation and be required to remove hate speech; this may include active measures. Certain platforms may be required to take particular measures to protect consumers.

Platforms may be held liable for illegal material. This includes child abuse content, terrorism content, and hate speech on social media platforms such as Facebook and Twitter/X, copyright violations on media platforms such as YouTube and defective, dangerous, counterfeit or otherwise illegal products on e-commerce platforms such as Amazon. Liability may also apply to news aggregators, search engines, and app stores for providing links to illegal content or websites that pose security risks. Ad-based platforms may be held liable for including misleading advertising. Platforms holding personal data may be held liable for the misuse of data by third parties. Regarding their own operations, platforms such as Uber and TaskRabbit may also be held liable for discrimination on the platform.

Platform liability has traditionally been very limited. For instance, according to the EU's eCommerce Directive that was adopted in 2000, hosting platforms are exempted from liability for hosting illegal material in the European Union (EU) provided that they remove illegal material expeditiously upon obtaining knowledge of it.[37]

[36] Art. 5(3) DMA states: "The gatekeeper shall not prevent business users from offering the same products or services to end users through third-party online intermediation services or through their own direct online sales channel at prices or conditions that are different from those offered through the online intermediation services of the gatekeeper."

[37] Articles 12 to 15 of Directive 2000/31/EC. For details on the directive, see, e.g., Buiten, de Streel, and Peitz (2020). The key rules and principles continue to apply under the Digital Services Act (DSA).

To conceptually address the issue, it is useful to introduce 'good' and 'bad' sellers as well as consumers who may be negatively affected by 'bad' sellers. A platform may engage in active measures to detect and remove bad sellers from the platform; its incentives are affected by the liability regime. Beneficiaries of such active measures may be 'good' sellers (e.g., brand manufacturers who will be better protected from counterfeit products or copyright holders who will be protected from illegal copies), consumers (e.g., in the case of the removal of defective or dangerous products), and society at large (e.g., after the removal of terrorist content or malware or after removing sellers of exotic animals whose trade is forbidden). A profit-maximizing platform will partly internalize the benefits of those users whose behavior affects revenues. Thus, the platform may have some incentive to combat bad sellers even in the absence of liability.

De Chiara et al. (2022) consider harm to good sellers (copyright holders) and the incentives of the hosting platform to remove infringers; Jeon, Lefouili, and Madio (2022) endogenize the incentives of good sellers to invest in quality (brand manufacturers suffering from counterfeits). Zennyo (2023) endogenizes the incentives of sellers to maintain quality; see also Yasui (2022). Hua and Spier (2023) investigate a platform's monitoring effort and pricing strategy in response to changes of the liability regime and uncover which market environments call for stricter platform liability and which call for weaker platform liability.

Regulation on data privacy and data security applies to firms holding personal data; in the EU the General Data Protection Regulation (GDPR) sets out how firms can store, process, and use personal data. While this regulation is not targeted towards digital platforms, they must comply. Digital platforms may also impose rules on third parties regarding the use of personal data and information disclosure thereof to individuals who provide those data. For example, Apple requires information about the app's privacy practice when a developer submits a new app or an app update to the App Store.[38] This suggests that digital platforms may react to regulation (or anticipate regulatory intervention) or use existing or imminent regulation as an excuse for their updated platform design and thereby affect competition on the platform and between them. Economic analysis can help to uncover unintended consequences of regulation that is motivated by the protection of a certain user group.

5. Conclusion

In digital ecosystems, some firms (typically dominant platforms) operate as private regulators (Boudreau and Hagiu 2009), which are possibly constrained by public regulation. Public interventions may try to avoid exploitative and exclusionary abuse by these firms. They may also aim at making or keeping the market contestable such that dominant platforms can be successfully challenged. What is more, regulation may aim at addressing externalities to bystanders including society at large.

Existing or proposed changes in competition law and regulations may or may not be well-suited to deal with the dynamic consequences in platform markets characterized by scale economies, network effects, multi-sidedness, and other features. Moreover, the technologies that platforms use and develop evolve very rapidly. This means that there are many open

[38] See https://developer.apple.com/app-store/app-privacy-details/, last accessed November 13, 2023.

questions that need to be addressed with a good understanding of the relevant market characteristics and the institutional features and limitations of regulatory authorities. Economic analysis can provide valuable input to regulatory proposals and their implementation and, as this chapter has documented, has done so with the use of theory and empirical analysis.

As explained in this chapter, digital platforms engage in many activities that aim to solve or mitigate market failures. Regulation must be careful not to reduce the ability of current or future platforms to perform this task. However, firms with market power may not perform the task in the socially optimal way. For example, participation by one or multiple user groups may be socially insufficient because of high prices or low quality. Also, a platform may underinvest in the screening of faulty products. What is more, platform governance rules aimed at facilitating interaction may have negative knock-on effects on users (unfair treatment, invasion of privacy, etc.).

With these insights in mind, one can, for instance, ask to which extent divestiture obligations imposed on a platform would reduce the associated network benefits that platform users enjoy. Would future platforms invest in bringing economic agents together if they anticipate that, once they have succeeded, they will be forced to share the benefits with competing platforms through some form of interoperability? Such a question can be asked in the case of remedies as foreseen in the EU Digital Markets Act, such as interoperability or data-sharing obligations. There is a need for more research addressing these questions, and such efforts are needed urgently because regulators have the mandate to act and cannot just sit back and wait for relevant research to emerge.

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