THE ECONOMICS OF PLATFORMS: A THEORY GUIDE FOR COMPETITION POLICY

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The Economics of Platforms: A Theory Guide for Competition Policy

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Over the past 20 years, the development of the internet has transformed the global economy and had an impact on almost every aspect of our lives. Designed primarily as a means of communication, the internet has revolutionized the way we produce and exchange services and goods, whether they are digital or not. A simple comparison of the world’s most valuable companies in 2007 and in 2018 is a clear testimony of this change. Not only have standard brick-and-mortar firms progressively disappeared from the list, but companies of a new kind have emerged at the top. Since the development of computers in the 1990s, tech giants like Apple and Microsoft have taken over, at least partially, from more traditional firms operating in banking, insurance or the oil industry. But the past 15 years have seen another wave of companies – like Amazon, Alibaba, Baidu, Facebook, Google, Airbnb, Booking.com or Uber, to name a few – whose business model is mainly to facilitate interaction between individuals and/or businesses. These companies rely on different business models but they belong to the same general category, now known as platforms, and share many characteristics. The objective of this report is to discuss these common features in order to explain the functioning of markets with platforms. The main focus of this report will be on whether competition can be effective.
# Table of Contents

I. Introduction ............................................................................................................. 4

II. Either or both: are platforms natural monopolies? ................................................ 9

III. Competition for the market ..................................................................................... 15

IV. Competition in the market ....................................................................................... 24

V. Competition policy .................................................................................................. 34

VI. Conclusion .............................................................................................................. 52

Bibliography
I. Introduction

Over the past 20 years, the development of the internet has transformed the global economy and had an impact on almost every aspect of our lives. Designed primarily as a means of communication, the internet has revolutionized the way we produce and exchange services and goods, whether they are digital or not. A simple comparison of the world’s most valuable companies in 2007 and in 2018 (see below) is a clear testimony of this change.

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Not only have standard brick-and-mortar firms progressively disappeared from the list, but companies of a new kind have emerged at the top. Since the development of computers in the 1990s, tech giants like Apple and Microsoft have taken over, at least partially, from more traditional firms operating in banking, insurance or the oil industry. But the past 15 years have seen another wave of companies – like Amazon, Alibaba, Baidu, Facebook, Google, Airbnb, Booking.com or Uber, to name a few – whose business model is mainly to facilitate interaction between individuals and/or businesses. These companies rely on different business models but they belong to the same general category, now known as platforms, and share many characteristics. The objective of this report is to discuss these common features in order to explain the functioning of markets with platforms. The main focus of this report will be on whether competition can be effective.
Let us start by defining more precisely what we mean by a platform. At first glance, the firms mentioned above are quite different. Facebook is a social media website, Google a search engine, Amazon and Alibaba are marketplaces, whereas Uber matches drivers and riders. Despite these very different activities, all these firms have built their models to act as an intermediary, connecting two groups of economic agents. This is easy to see in the case of Airbnb, Uber, Amazon and Alibaba. As far as Baidu, Google and Facebook are concerned, the connection is more subtle. Google, for example, is a free search engine that also provides other free internet-related services. But it monetizes the information about its web users by selling targeted advertising or by sharing information with firms. In this sense, Google has created a way to collect information about potential consumers and to sell this information to potential sellers. Facebook, the largest social media company in the world, allows users to be connected and exchange news and photos. Facebook appears first as a tool to create social links between users. But this service is free, and the source of profit can instead be found in the information or screen space Facebook sells to advertisers. By keeping users connected and communicating with each other, Facebook retains their attention and sells it to advertisers. In all these cases, ‘multi-sided’ platforms are intermediaries that connect different groups of economic agents.\(^1\)

In a sense, none of the business models we have described are really new. Amazon and Alibaba are the modern equivalents of ancient fairs, whereas Facebook or Google, who compete for attention, have developed business models that share many features with traditional media. But the constant connection of users to their computers or smartphones and the huge number of potential users for every successful internet firm has made any such business a potential worldwide monopoly. In the digital economy, the combination of network effects and economies of scale have allowed platforms to achieve large-scale expansion.

What are the general characteristics of platforms? Why are they different from standard intermediaries? Platforms, just like classical intermediaries, connect two groups of economic agents: sellers/buyers, drivers/riders, readers/advertisers, etc. They act as a matching device, allowing each side of the market, or at least one side of the market, to find the best agent on the other side – that is, the one that generates the highest profit. The fact that so much information is available on the internet facilitates this matching process, compared to more traditional ones. The emergence of matching platforms is part of the “dis-intermediation” process that has led to potential separation of information management from production/stockage and delivery. Hence, some platforms are pure “infomediaries”, focusing on

\(^1\) In this report we shall be concerned solely with multi-sided platforms, and therefore will omit the adjective ‘multi-sided’. The term ‘platforms’ has however been used in different contexts, not all multi-sided.
information, acting as aggregators like TripAdvisor or Kayak, or sharing platforms such as Airbnb or VRBO. Others such as Amazon Marketplace provide matching, as well as support for transactions and delivery. But a common feature that distinguishes these platforms from traditional resellers is that they allow autonomy for agents on both sides of the market to meet and define trade (see Hagiu and Wright, 2014).

Consequently, potential users of a platform are often particularly concerned about the size of the other-side population to which they will be matched. A seller is more likely to visit a platform if there are many potential buyers; similarly, a buyer is more likely to visit a platform if there are many potential sellers. This first characteristic of platforms is crucial: it is a form of network effects which explains why the market tends to favor large platforms. There are network effects when each user’s satisfaction from consuming the good increases in the number of other users of that good. A communication device such as the telephone is the most obvious example of a good with network effects. The more people who have a phone, the more people I can call, and therefore the higher the satisfaction I get when I buy a phone subscription. In the case of platforms, network effects often operate slightly differently as they concern different groups of agents. Indeed, potential sellers value a platform more if there are more buyers, not if there are more sellers. So, in contrast to our initial example of a communication device, many platforms match agents from different groups. Using the standard terminology, this means that platforms are able to generate or take advantage of inter-group or multi-sided network effects rather than intra-group or direct network effects. Sometimes, there are intra-group and inter-group network effects at the same time. In the case of Facebook, most users are on the network because their friends are too (the intra-group effect) but advertisers want to be on the network because many people use it (the inter-group effect).

Through network effects, every agent, by subscribing to a platform, generates value for some other agents on the platform, which can be positive or negative. This generated value, which is usually called an externality, is a common feature of platforms and what are now called two-sided markets. This externality can be intra-group, as when a new Facebook user increases the value of the network for all other users. But it can also be inter-group, as when an additional driver makes the use of Uber more interesting for riders. The recent literature on two-sided markets recognizes that intermediation is

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2 The literature sometimes refers to this as indirect network effects. In this scenario, increased participation on one side of the platform increases value on the other side, which can in turn increase the value of the original. For example, a new buyer may benefit all other buyers if it raises the number of sellers.
characterized by large, positive inter-group network effects and explores the implications for pricing and other business strategies, as well as for social welfare.

Regarding pricing, some groups are important for the other sides, whereas other groups are less important — for example, users are essential for advertisers on a platform while users may care less about advertisers. If the platform can identify each user, and in particular the group to which each user belongs, then it can price the various groups differently. One important subject of study will be how platforms set their prices on the different sides of the market, and we will see that the value of the externality is a key component of the optimal pricing formula. And because inter-group externalities are different from one side to another, the prices set by a platform for different groups will be optimally different.

As in any market, prices are important factors for demand. But the presence of network effects also increases the significance of another element, generally overlooked by market theory: the belief every agent holds about the future behavior of the other agents. Since the benefit every agent gains depends on the number of agents he can trade with, there is a potential coordination problem in that I will only choose a platform on which I am likely to find a partner, but this is also true for my potential trading partner. Therefore, my choice depends on what I believe the other agents will choose, and vice versa. This means that the same platform — that is, a firm offering the same intrinsic good or service — will be successful if everyone believes that it will be successful. If no one believes that it will attract customers, it will be unsuccessful. This belief dependency explains the additional uncertainty that exists about the success or failure of platforms, compared with firms in more standard markets. Of course, the price chosen by a platform can take these beliefs into account or attempt to counteract pessimistic beliefs. But sometimes there is no price that will allow a firm to offset agents’ pessimistic beliefs and still make a profit. The problem is even more acute when a firm attempts to enter a market where there is already another firm. In contrast to standard markets where agents can be gained individually, it is now necessary to attract groups of agents, triggering collective moves and achieving a critical mass. Success here depends on the ability to set smart prices but also to change consumers’ beliefs about market dynamics. A complete analysis of competition between platforms will need to understand how prices are set, how beliefs are formed, and how prices and beliefs interact to define the competitive environment.
The starting point of this report will tackle the issue of natural monopoly and the extent to which platforms are natural monopolies. There is growing debate about the possible break-up of many so-called “dominant platforms”, in particular Amazon, Facebook and Google. The issue of the economic sustainability of competition in those markets needs to be addressed. More precisely, we will discuss the features that make a market more likely to be a natural monopoly. This issue is crucial to the central policy questions: where platforms are ubiquitous, should digital markets be left under current regulation and ex-post anti-trust scrutiny like most other markets? Or do digital platforms require new regulations of the exercise of market power to guarantee the good functioning of the market, as well as reconsideration of anti-trust enforcement? Depending on the answers to these questions, two main roads can be followed.

Where the markets in which platforms operate are some form of natural monopoly, we will discuss the elements that favor the emergence of a profitable market and the extent to which this market can be contested. The fact that a market is a natural monopoly does not prevent competing firms from contesting the position of the monopolist. But the competition in this case is for the market rather than a standard competition in the market. We will therefore discuss when this competition for the market can prevail and whether new firms can contest the dominant position of an incumbent in this type of market. While this discussion will concern markets with “tipping” on one platform, the lessons will also be insightful about the ability of new entrants to emerge in markets that can only support high concentration.

If the market under scrutiny is not a natural monopoly, it will be crucial to analyze in more detail the different forms that platform competition can take. The most common form to be analyzed is price competition, and we will discuss the likely competitive prices and their normative properties. We will see how price competition between platforms depends on the behavior of the agents, in particular on their decision to stick to one platform or to potentially visit more than one platform. This choice, to “single-home” in the first case or to “multi-home” in the second case, will be pivotal in the outcome of competition between platforms.

The last part of this report will be dedicated to discussing competition policy issues in two-sided markets. As competition is not solely based on price, we will have to discuss some non-price dimensions related to the design of the service chosen by competing platforms. Markets where platforms are prevalent have been the focus of many competition agencies over the past 15 years. Firm
behavior has been investigated and some practices have been considered anti-competitive. However, the rules generally used to assess the competitive or anti-competitive nature of firms’ policies have been designed for standard markets. We will therefore revisit the classical questions in competition policy in the context of two-sided markets where the competing firms are platforms. In particular, we will discuss the notion of market power, the essential definition of markets, and the consequences of platform practices such as tying, exclusivity or mergers.

Our program for this report is therefore quite extensive and will lead us to address the central question of whether platforms alone can solve efficiency issues. By facilitating matching, platforms play the role of information aggregator and generate some value to the economy as a whole. Still, the possibility of coordination failure is a first impediment to fulfilling economic efficiency. Moreover, the prices set are rarely optimal, either because of the platform’s market power, or because competition between platforms drives them to distort prices compared to the first-best. Therefore, it is not clear that platforms, either in a monopoly position or in a more competitive context, can lead to efficient allocations. But when they do not, the solution to improve social welfare is often hard to implement. All these questions will be discussed in the different sections of this report and form the cornerstone of the debate about platform competition.

II. Either or both: are platforms natural monopolies?

This section deals with the optimal number of platforms in a market. More precisely, we would like to understand what market configuration should or could prevail in digital markets. This is an important question since, depending on the answer, society should support some form of intervention or market regulation.

In many markets, economists tend to favor competition as the main regulator of economic activity. Indeed, it is generally acknowledged that with more firms competing, there will be more opportunities for consumers to find the products they like best at a low price. This general statement suffers from a few exceptions. In particular, there are some markets where only one firm can reasonably survive while making a profit. This is usually the case when the cost structure favors big firms which produce a large quantity of the relevant good. When there is a large set-up cost, or more generally when cost structure exhibits increasing returns to scale, then the market is likely to support only one firm. An example of
such cost structure can be found in the electricity or transport sectors where the replication of infrastructure prevents the entry of a new private actor. Since the industry can make a profit only when one firm is operating, we cannot expect to see competition in these sectors, at least on a permanent basis.

In digital markets, there are often increasing returns to scale, as content is easily duplicated and distributed, but the low level of fixed costs does not in general impede entry of several firms. In these markets, the presence of network effects tends to play a similar role to the one played by the presence of a fixed cost in traditional network industries. More precisely, in traditional network industries, economies of scale are such that the average cost per user decreases with the total number of users. Therefore, the average net revenue per user is an increasing function of this total number. In digital markets, average net revenue per user also increases with the total number of users, but it is because more revenue can be generated per user rather than because the cost is going down. As the number of users goes up, the user’s willingness to pay also goes up, as does the price the firm can set for its service. And the competitive advantage of the firm over its rival is increased.

Consider a hypothetical situation where two firms, A and B, act as platforms and compete to attract users. At this stage, we assume that connecting people is the only activity of the firm and abstract from price competition by assuming that the service is free. This means that these two firms are ex-ante perfectly identical. We now consider that there are network effects at the firm level. Let us assume that initially, firm A captures slightly more than half of the market, firm B capturing slightly less. Because the sizes are different, the benefit every agent can get on either platform is different. Indeed, the utility obtained from buying service A is larger than the one obtained when buying service B. In this situation, all B’s consumers would be willing to move to firm A when the opportunity occurs as its quality/price ratio is higher. Therefore, if the switching costs between A and B are not too large, some of B’s consumers will switch to A. This move will amplify the difference between the two firms and ultimately all agents will opt for firm A.

In the presence of network effects, and more precisely when the only reason why people subscribe to one firm is to connect to other agents, there is a tendency for markets to favor only one firm, referred to

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3 This is not to say that economies of scale play no role, as they make monopoly feasible. Diseconomies of scale would imply a maximal size of any firm even with network effects; this size is reached when the cost of expanding the network is larger than the network benefits.
as tipping. This trend is efficient because the larger the number of people in the same network, the larger the marginal value created by an additional user.

Still, this situation of natural monopoly is not the only possible outcome for platform competition. At least three elements can prevent a market exhibiting network effects from being a natural monopoly: the existence of a standalone value, the possibility for users to multi-home, and the existence of compatibility.

Let us consider the first element. Most platforms are not simply match-makers, even if the presence of cross-side externalities is indeed a fundamental aspect of their business model. Quite often, platforms are also service providers. It is these services, which usually are different from one platform to another, that allow them to attract users from one side independently of the actions chosen by the other side. Consider, for example, the most well-known search engine, Google, which links consumers and advertisers. Since only the advertisers value the presence of agents on the other side, this platform needs to find a way to attract consumers. This is done by offering services to consumers, in particular organic search.

Let us return to our example where two platforms compete. Even if most consumers were initially on another platform, some may be willing to switch because the quality of service offered by one platform is good enough to compensate consumers for being on the smaller platform with lower network benefits. A search engine is an extreme case because the agents on one side of the market do not care about the number of other users of the platform. But the same reasoning can be made for more conventional platforms. If the service proposed by the smaller platform is valuable for consumers, or at least for some, then this platform may be able to survive even if it attracts fewer consumers. Note that this platform’s differentiation can also be achieved by offering different types of services. The more different platforms are, either in reality or simply in the eyes of consumers, the less network effects will be important in the competitive process and the more different platforms will be able to survive in the market.

The second element that can mitigate network effects is the possibility for consumers to multi-home, potentially subscribing to more than one platform. Let us first assume that any agent can decide to join either zero, one or two platform(s). As long as there are two active platforms, and some agents choose to join only one platform, the other agents will have incentives to subscribe to all platforms. Multi-homing
allows agents to benefit from large network effects and potentially the services of the two platforms. By contrast, single-homing agents support lower costs but may fail to be connected to some other users. Therefore, if some agents can multi-home, there may be scope for stable situations with multiple networks. The question of the sustainability of more than one platform will be driven by the cost structure and demand heterogeneity, in terms of valuation of services and network effects.

When the platforms decide, or are obliged, to adopt some interoperability, having more than one platform may not be costly for social welfare. In this case, each user has some incentive to choose only one platform, as this is enough to be connected to all the other agents. But it is far from clear that all platforms have incentives to accept this interoperability. Let us return to the case of two firms, A and B, assuming that firm A initially captures a larger share of the market than the other firm. Each firm faces the same trade-off. By allowing interoperability, consumers are connected to more people, which increases their utility and therefore the price can be set. But interoperability also means that both platforms propose exactly the same service, with the same quality of network effects, and this exacerbates competition. The way this trade-off is solved depends on the relative size of the platform. When a platform is small, it can only gain from interoperability since its consumers will be better off and it will appear a much better platform than before compared to the other. Conversely, if the platform is large, its users’ gain will be limited whereas its competitor will now increase its attractiveness. Consequently, a platform’s incentives to accept interoperability will be low when the platform is dominant.

We have insisted on the fact that, in general, to avoid tipping and a situation where only one platform operates on a market, platforms must exhibit some form of differentiation, absent any interoperability. But this differentiation may be linked to network effects. In other words, we can have some industries in which two or more platforms co-exist despite being formally homogenous. For this, it is necessary to have not only two sides but also some congestion on at least one side, defined as a reduction of network benefits on one side when more participants from this side join the platform. If a large platform becomes too congested, then the consumers most affected by congestion may prefer to join a smaller, less congested platform.

This fact is discussed in length by Karle, Peitz and Reisinger (2018) who mostly have in mind the example of housing rental platforms. In many countries, there are multiple platforms that co-exist, despite the presence of strong network effects. To understand this, it is important to realize that while one side of the platform (consumers) value only positively any additional agent (sellers) on the other
side, the other side may also value negatively any additional agent on the same side because this intensifies competition on the platform. In other words, the authors consider the competition between sellers as they offer substitutable products. When the degree of competition between sellers is low, the platforms have strong incentives to attract as many sellers and buyers as possible. As they have the same objective and strategy, it is very likely that only one will survive. When competition is intense between sellers, some sellers may prefer to go to a smaller platform to escape competition even if it comes at the cost of reduced demand. Consumers will also split between the two platforms and there will be no segmentation of the market. Of course, this reasoning is only correct if consumers have to choose only one platform. If they could multi-home, sellers would again all compete against each other, which tends to favor agglomeration and ultimately the survival of only one platform.

In the above contribution, the two platforms were creating endogenous differentiation in a setting where agents could only choose one platform. When agents can multi-home, ex-ante identical platforms may also achieve some ex-post differentiation by adapting their business model. For instance, an ad-free, pay service may coexist with a free, advertising-financed service (see the discussion of Calvano and Polo 2018 in section 4).

In short, to sustain competition, platforms must generally exhibit some elements of differentiation. This can either be in the service they provide on top of the matching service or in the way the matching service is designed.

How differentiation shapes the long-run market structure depends on the extent of differentiation relative to network effects and on the firms’ pricing strategy. Cabral (2011) provides interesting insights on the role of prices on competition and the issue of tipping. His contribution is one of the few full-fledged analyses of competition with network effects and forward-looking consumers (that is, those trying to anticipate the choices of future consumers) facing high switching costs. Cabral studies a network duopoly with firm A and firm B facing constant arrival of new consumers and departure of old consumers. One important assumption is that a consumer stays on the same network until departure from the market. Demand is uncertain, as every new consumer can either be biased toward firm A or firm B, so that it is not possible to predict with certainty which network consumers will choose in the future. When network effects are small, the differences in consumers’ valuations of the two services (horizontal differentiation) prevail and, as in standard competition with product differentiation, the market converges dynamically to a stable situation where the two networks share the market. When network
effects are large, however, the dynamics is more complex. In this case, Cabral (2011) shows that the market will stay for a relatively long period of time in a situation where firm A has a large market share and firm B stays small, until a sufficiently large shift in demand favors firm B. The market then tips toward B and a new period arises in which firm B has a large market share and firm A stays small, until a new cycle starts again. Hence, the market dynamics exhibit something close to tipping with two characteristics. First, full tipping doesn't happen; second, dominance is temporary. An intriguing question is how the small network can survive long enough to take over when the demand changes. To answer this, let us consider again the two-firm case discussed above and assume that firm A has captured significantly more consumers than firm B. In this situation, if both firms set the same price, most new consumers would be willing to buy firm A’s services. Can firm B do something about it? One natural move would be to lower the price. But then firm A could also lower its price to stay more attractive thanks to larger network effects. It turns out that it may not be in firm A’s interest to do so. Let us study the tradeoff faced by this firm. Because firm A proposes larger network effects, it has more market power and could exploit it by raising its price. Doing so would generate high current profit but raise the risk that demand goes to firm B, which would threaten its future leadership position. To avoid this, firm A could protect its position by setting low prices. The choice will then depend on the market share. When firm A’s market share becomes very large, exploitation of market power becomes more profitable than protection of future rents. Under the umbrella of firm A’s high price, firm B can survive with lower prices and full tipping never occurs.

The key insight is that short-termism and exploitation of market power may lead the dominant network to accommodate the presence of a small competitor. It also shows that the traditional notion of tipping prevalent in the economic literature, whereby a single network survives and cannot be challenged, may be oversimplified as a representation of the outcome of network competition. It may be better to think about tipping as a dynamic process alternating periods of competition for the market and periods of dominance of one (or very few) network(s).

This points to a difference between technological economies of scale, as experienced in many traditional network industries, and demand-induced returns to scale, as in most digital markets. In the former case, large fixed costs prevent the existence of small players. But in the latter case there is usually a lot of heterogeneity and scope for horizontal differentiation. Given that entry costs are small in digital markets, even if a market is prone to tipping there is the possibility for small niche entry exploiting heterogenous perception of network effects. For instance, a social network may be focused on a small
circle. Although no threat to the large dominant network in the short run, these small niche competitors will maintain some dynamic competitive pressure on the incumbent as they have the potential to become future challengers.

III. Competition for the market

As discussed above, large network externalities proposed by incumbents may impede successful entry by a new entrant, because it needs to attract initial users despite low network externalities. On the other hand, as the presence of externalities raises the prospective revenue of a successful platform, this may attract more resources devoted to entry.

To address this issue, we discuss in this section how firms compete when ultimately only one firm can operate in a market. This type of competition is often called competition for the market, or ex-ante competition, in contrast to competition in the market, or ex-post competition. For our purposes, network effects will be the major force shaping this competition. So we will start by discussing this notion in a general context that does not need to be two-sided, even if the analysis would be relevant in a two-sided context. Then, we will see how and when network effects give an incumbency advantage allowing a dominant firm at one period to preserve its dominant position in future periods. We will see that some arguments are general while others may be more specific to a two-sided environment.

Let us first discuss the core patterns of network effects at the level of consumers. At this stage, we do not discuss the firms’ choice – for example, of price – and we assume a monopolist structure.

As discussed before, the benefit derived by any user from the network good depends on the number of other users, but also in many cases on the characteristics of the good itself. At this stage, we assume that only the first element prevails as the complexity and specificity of the analysis comes from this element. Indeed, when evaluating ex ante the benefits from buying a network good or subscribing to a network, a potential user must anticipate the number of other users who are making or will make the same choice. The presence of anticipation in the choice made by each user is crucial for understanding the specificity of network goods. Most of these goods lose a large share of their value when the number

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4 Most of the economic literature has focused on the case where the market tips toward a single platform. Some insights should carry out to the case where the market concentrates on a few winners, although this has drawn less attention.
of users is limited. Even a good with potentially huge benefits may fail to emerge because users do not believe that enough people will adopt it, or because there are not enough early adopters. Most of the existing analyses rely on this idea of fulfilled expectations in a static framework but others rather rely on a dynamic approach in which potential users have a myopic view and consider the current network size in making their decision.

To understand more clearly the consequences of the presence of the network effects for the satisfaction users derive from network goods, let us assume that potential users only differ in their standalone value for the good, whereas the network benefit is identical across users. Some consumers are more eager to buy the good because their standalone value is higher whereas some other consumers will buy the good only if they believe that enough people will do so. To derive the equilibrium – that is, the number of subscribers in this setting – one must compare how standalone benefits matter with network effects. Let us focus on the case in which the network effect is the dominant element driving the consumers’ decision. Then, there may exist several stable demand configurations, with various levels of participation. A low level of participation reduces the value of the good which makes it rational for a large part of consumers not to buy, while a large level of participation induces more consumers to buy. As an illustration, consider the following graph: on the horizontal axis we measure the market share of the network; on the vertical axis we represent the value of network externality. Then the blue line represents the value of network externality as a function of the market share, assumed to be linearly proportional for conciseness. Therefore, the more people join the network, the higher the benefits for subscribers. The red curve represents the demand function that relates to each value of network externality the induced demand for the network good. In other words, for each market share, it describes the network externality value that consumers should anticipate for this to be the realized demand. Starting from any level of market share, the participation increases if the value of network effects is larger than the level that would induce this level of demand (if the blue line is above the red curve) and decreases otherwise.
Of course, prices shape the allocation. Figure 1 represents a situation where the price is above the highest standalone value but below the maximal value of network effects (obtained when all consumers buy the good). When the market share is zero, the blue line is above the red curve so there is not enough benefit for the first agent to join the network. Conversely, when the market share is one, the red curve is above the blue line meaning that the total benefit (standalone value plus the total externality) is more than enough to induce the last consumer to join if all the others have already joined the network.

In this scenario, we may end up with a final situation in which there is no user, but it is also possible that all consumers adopt the network good. Indeed, it is rational for a consumer not to buy if all others do not, and to buy if all others do. In this case, there may be even more equilibrium outcomes. The price the marginal user is willing to pay is higher the more people adopt the good, so demand for the good increases with the number of subscribers expected by consumers. In Figure 1, we have three equilibrium situations: first, at 0 with no user, because the benefit for the first user will be too low; second, at 1 where all users choose to buy the good, the total benefit exceeding the price; third, an intermediate equilibrium at C, where a subset of the most eager users buy the good. In this situation with multiple equilibrium outcomes, some are more stable than others. Indeed, the interior equilibrium C may not persist because a change in the decision to buy the good by a small subset of users would lead all the others either to buy the good or not to buy it anymore.
Figure 2 represents a situation with three equilibria, all with partial participation, at levels A, B and C. Note that in this case the price is below the maximal standalone value so even when the market share is zero, some consumers may be willing to buy the network good.

The lesson to be kept from above is the fact that potential users’ anticipations are crucial when network effects are present. This is true both in one-sided and two-sided contexts. Convincing a user to choose the product is not an easy task, even when there is no potential competition. As we will see, this is even more complex when there is some potential competition, or for a new firm, when a firm already operates on the market.

Let us now discuss how competition could occur when there is a firm already in place. This is the major question. Indeed, there is a common belief that in the digital economy, because of network effects, the leader has such an important advantage that no entrant will be able to replace him. Even though this view is not unanimous (see Evans, 2017), it is shared by many public decision-makers. We therefore want to understand what can lead dominance to persist, or when and how the dominant firm can be replaced by a new one.

For this let us follow Halaburda et al. (2018) and consider a situation where two platforms, called A and B, compete. Each platform offers a good that has two characteristics. First, this good can have different levels of quality. This is the case, for example, when a direct service is linked to a subscription. Second,
the good provides network benefits, the satisfaction of consumers increasing with the number of users on the same platform. The first dimension is referred to as the quality effect, whereas the second dimension is referred as the network effect. We assume that the second dimension dominates the first one. This last assumption needs to be clarified as the network effects depend on the number of agents on each platform, and the choice of each agent to join platform A or B also depends on the prices set by the two platforms. To clarify, suppose that when the prices set by platforms A and B are equal, the quality differential between A and B is not large enough to compensate for the network effect if all the agents choose to opt for the same platform. In other words, the satisfaction generated by the full externality is always larger than the satisfaction generated by a higher quality good.

Despite this assumption, there is scope for competition. Suppose that A is the initial dominant firm, such that in the initial period all agents subscribe to firm A. It may be that another firm sets a price low enough such that the difference in price outweighs the network effect. In fact, this analysis is more complex as prices may be close. Then, at the time when consumers choose a platform, they do not know what the choice of the other users will be. As already discussed, the equilibrium that will prevail depends on the beliefs held by the agents. Halaburda et al. (2018) define the notion of a focal platform to solve for this indeterminacy. A focal platform is one that every single agent believes will be chosen by the other agents when there is some indeterminacy. In this dynamic environment, the focal platform at any date is assumed to be the platform that was dominant the date before. This assumption is both very intuitive and very useful. It is intuitive as it allows us to study the extent to which dominant platforms will remain dominant, by providing this platform with what is referred to by Biglaiser and Crémer (2016) as an “incumbency” advantage. It is also useful as it will allow us to solve the equilibrium indeterminacy and predict winners.

A general insight is that while incumbency advantage creates some barriers to entry, they may be weakened by dynamic competition considerations. The reason is that the prospective benefits of gaining future incumbency advantage for a superior quality entrant are larger than the prospective benefits of a lower quality incumbent preserving its position. Hence a high-quality, forward-looking entrant may be willing to sacrifice more in current competition than the low-quality incumbent.

Let us start our investigation with a pure static framework, where we suppose that platform A is the focal platform. Platform A can then stay the dominant firm even if it offers a lower quality good than platform B. Suppose that B offers a price equal to the marginal cost per user (that is, the minimum price that
does not generate negative profit). If A sets the same price, then all consumers strictly prefer to stay with A rather than switch to B, even if B has superior quality. As they expect other consumers to stay with A, when they compare the potential utility derived from both platforms, consumers compare one good – platform A – with some network effects across all individuals and another good – platform B – with a higher quality. According to our assumption, the network effects dominate the quality effects, so all consumers will choose A. Platform A can even choose to raise its price, at least to a level equal to the perceived difference between the network effects and the quality effects.

What are the changes induced by taking dynamics into account? Is there now a way for an entrant offering a better quality service to overtake a less efficient incumbent? To answer these questions, the authors consider a dynamic environment but first assume that the time is finite, so there is a last period. To get a simple intuition, let us focus on the case where there are only two periods. To understand the dynamics, we first discuss the optimal strategy at the second period, depending on history... This means that we take as given the outcome of the first-period competition. At the beginning of period 2, there is a focal firm which is the winner of the first-period competition. As we have discussed before, in a one-period setting, nothing can prevent the focal firm from winning the market.

The meaningful analysis should then be on what occurred before this last period. At the beginning of period 1, suppose that firm A is focal (for instance, because it was originally the only platform). Firm B knows that if it sets the same price at firm A, it will not be able to win the market. But firm B can decide to set a low price, below cost, and win the market. In contrast with the previous case, the non-focal firm now has more than one period to benefit from its quality advantage. Since it knows that winning the first-period market guarantees that it will win the second period, it is willing to sacrifice a lot initially. If there are more than two periods, it is even easier for a more efficient entrant to overtake a less efficient incumbent. As soon as the entrant becomes the focal firm, there will be no way for the former incumbent to displace the new and more efficient leader. The more efficient firm will then be able to make some positive profit over a longer period, inducing this firm to be more aggressive initially. In short, in a dynamic framework, an initial advantage is not enough for a less efficient focal firm to maintain its dominant position. The higher the quality of the potential entrant, and the more periods the competition will last, the more aggressive the potential entrant will be at the earliest date in order to benefit for as many possible periods from its superior quality.
Note, however, that there is still some indeterminacy when there are an infinite number of periods. In this case, a very patient but inefficient incumbent may be willing to sacrifice a lot at every period, hoping to recover the current losses in the very distant future. If it is expected to do so, entry may be discouraged by the prospect of a very aggressive incumbent’s strategy that reduces profit and the level of sacrifice that an entrant is willing to make. So, dynamics only restore efficiency if firms do not care too much about the very distant future.

If dynamics is important, it is because some current losses can be recovered in the future but, at the same time, it is also because some firms are more prominent than others, their incumbent position generating favorable beliefs from consumers. Whereas Halaburda et al. (2018) focused on the role of dynamics in restoring efficiency and fighting unfavorable beliefs, Caillaud and Jullien (2001 and 2003) looked at the role of differentiated tariffs across sides.

These path-breaking contributions analyzed how two firms, one incumbent and one potential entrant, optimize their prices in order to respectively protect or conquer the market. This is done in a setting that has become canonical for the study of trades in a two-sided platform environment. Caillaud and Jullien (2003) focused on situations where the platform’s only role is to match agents. In this case, there is no standalone value and therefore no utility gained on top of the utility obtained when two agents match. The agents originate from two different groups, called 1 and 2. Any match between a group-1 agent and a group-2 agent generates a value for the first agent and a value for the second agent. The gross value generated by the match can only be achieved through a costly matching process. An important element is given by the fact that the matching technology is not perfect, and it is assumed that match occurs only with probability \( \lambda < 1 \).

This match can be made by two platforms of equal quality, called I for incumbent and E for entrant. The payment system proposed by the firms has two components. A first price, \( p \), is paid by the users for the subscription to the platform and another, \( t \), is paid when the match is realized. When a consumer considers whether to subscribe to a platform, he/she must compute the probability of a match, which depends on the quality of platform and on the number of agents from the other side of this platform. Then, he/she is able to see whether the net expected utility – that is, taking the various prices into account – is positive.
When the setting is such that every agent can at most choose just one of the two platforms – a single-homing situation – Caillaud and Jullien (2003) showed that the incumbent is able to prevent the entry of a new firm. Still, this comes at the cost of profit dissipation, and the profit vanishes to zero. Let us elaborate a bit on that. Note first that it is optimal that all agents join the same platform since the probability of a match is maximized in this case. Suppose that initially, all agents subscribe to platform I. This means that any individual agent considering moving to platform E should be compensated. But attracting only one agent would not be enough, so platform E should separately convince many agents from one side to change. If platform E were able to do that, then the agents from the other side would have no choice but to also join platform E. Since attracting the first group of agents will be costly, platform E should recover this money, and this is done by charging the final transaction at the maximal price. Strategies that subsidize participation on one side and recover the loss with the induced revenue on the other side are called ‘divide and conquer’ strategies and they are sometimes the only way for a platform to pave its way into a market. But it is unlikely that the incumbent will accept the loss of its customers with no reaction. The optimal way for this incumbent to prevent entry is to make sure that all sides remain faithful in their subscription decisions. It will then charge the maximal price for the final transaction, just like any entrant would do, but also redistribute this money ex ante by subsidizing subscription to its platform. In this way, the incumbent can block any profitable strategy by a potential entrant.

A few remarks can be made here. First, in contrast to standard analysis with network effects, the existence of two-sided network effects implies that platforms can price-discriminate. Second, because of this possibility of price-discrimination, the potential entrant does not need to convince all the agents, but only a subset, to overcome an incumbency advantage. In a sense, in a two-sided market, the market power of the incumbent is reduced but it does not completely vanish. This explains the dual result that the incumbent can keep its dominant position but has to sacrifice all its profit to do so.

The situation in which agents may opt for more than one platform – called multi-homing – leads to slightly different results. Note first that even if the possibility of multi-homing increases the probability of a match, it may not be globally efficient. One has to compare the increased probability of a match induced by the second platform, which has value $\lambda(1-\lambda)$, and the additional cost induced on the second platform. Note also that it is now more difficult for a firm to subsidize consumers. A consumer can register on one platform to get the subsidy but then decide to be matched on the other platform. As

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5 For explanatory purposes, we take the view that the incumbent benefits from an incumbency advantage, although Caillaud and Jullien (2003) take a broader perspective deriving all possible outcomes of the game.
before, one should first look at the possible strategy of the entrant. This platform has three possible options. The first one is to decide to be the “second source”; that is, to realize the transaction only when the match has failed with platform I. In case of multi-homing, this will occur if the transaction price is higher with E than with I. The second option is to be the “first source”, that is to process all transactions for which it succeeds in performing the match. This can be achieved if the transaction price is higher with I than with E. The last option is to completely displace the incumbent and to become the “sole source”. This is only possible if one side does not register with the incumbent.

Assuming that all identical agents make the same choice, there are two possible equilibrium outcomes. When the value induced by the increased probability of a match outweighs the cost for search by an additional platform, multi-homing is efficient. Then two platforms can operate profitably on the market. Note that the two platforms being different ex ante, I is the focal one, and they will have different strategies and levels of profit. More precisely, platform I will make sure that platform E can only operate as a second source. Therefore, the incumbent will have a high registration fee and a low transaction fee, whereas the entrant will choose a low registration fee and a high transaction fee. Moreover, the incumbent will make a larger profit than the entrant, the latter being only able to capture the marginal value created by a second platform whereas the former can also exploit the fact that its transaction fee is lower.

Suppose instead that multi-homing is not efficient, in the sense that the net value generated by the presence of a second matching platform is below the cost of this platform. The incumbent can then prevent the entry of a new firm and still make a profit. This is achieved by setting a transaction fee equal to zero. In this case, platform E cannot subsidize the agents on one side at the registration stage, under the umbrella of multi-homing, as there will be no way to recover this money at the transaction stage. This case of multi-homing shows that, even if some efficient entry occurs, the incumbency advantage prevails. This is largely due to the fact that the incumbent benefits from the focality, which makes it costly for the entrant to conquer part of the market.

As a complement, let us remark that Caillaud and Jullien (2003) focused on the case where there are only inter-group externalities. As already mentioned, there can also be intra-group externalities, for example when there is congestion on one side of the market. This situation, analyzed in detail by Belleflamme and Toulemonde (2009), has a dual effect on the ability of an entrant to overtake the incumbent platform. On the one hand, it is at first easier to attract some agents from the congested side
since these agents are ready to pay a premium to be in a small group. On the other hand, when the number of agents from the congested side is low on a given platform, it is hard to convince the other side to join this platform. If the incumbent platform is free, or does not react to the potential entry, it can be shown that without congestion, a divide-and-conquer strategy would be successful, whereas the presence of congestion may still prevent entry. In short, the incumbency advantage is so important that even when the incumbent platform is free, a potential entrant may not be able to displace this incumbent.

Moreover, Caillaud and Jullien (2003) focused on pure intermediaries, where value is only generated when two sides are on board. Jullien (2011) extends the analysis to situations where the standalone value offered by a platform is sufficiently large to justify standalone participation even in the absence of network externality. Assuming that all consumers single-home, he shows that a divide-and-conquer strategy by an entrant is more effective at overcoming the incumbency advantage of a focal platform than in the case of pure intermediaries.

Most of the analysis has developed the idea that the incumbency advantage comes from the difficulty for a newcomer to change consumer beliefs about the likely market outcome. This is a major element but there may be other factors that explain this incumbency advantage in platform competition. For example, some people have claimed that data can be a source of incumbency advantage. This might be because past consumption data allows firms to propose the same good as consumed before, avoiding search cost for consumers, or because firms are now able to recommend goods that match the consumer’s preference (the interested reader can find a discussion of this in Biglaiser, Calvano and Cremer, 2019). The current policy moves and proposals to allow data portability can be seen as the consequence of these ideas, where data is seen as a key input for firms to compete on a market. Note that the impact on the platform’s initial offer of such a measure – which amounts to giving more ownership rights over data to consumers – is far from being clear.

IV. Competition in the market

The previous section focused on competition to win the market when only one platform eventually dominates the market. But in practice there are many cases in which multiple large platforms coexist. In this section, we are interested in the competition between platforms when the market structure has
stabilized. There are several reasons why, despite network effects, a market may stabilize before a single monopoly emerges. These reasons can be put into two broad categories: product differentiation and multi-homing. The first category refers to the fact that different consumers may have different views about the relative merits of two platforms and thus make different choices of platforms. The second category refers to the possibility that some agents use the service of several platforms which allows them to interact with distinct populations on several platforms. In what follows, we will study these two categories separately although it will become clear that they are intrinsically related.

Assuming that the market has stabilized on a market structure implicitly means that consumers have coordinated on a stable market allocation, which is assumed by most papers discussed below. Coordination may result from the market structure itself which may not be prone to mis-coordination of consumers and multiple equilibria, or it may result from an assumption that ensures some minimal efficiency in consumers’ coordination preventing large gains caused by reallocation of demand across platforms from being wasted.

**a) Product differentiation**

The seminal work on the effect of product differentiation on the competition between two-sided markets is Armstrong (2006) and Rochet and Tirole (2003), both leading to a similar key insight on competition between platforms in the market. We will focus on explaining the first contribution now, delaying the second to the moment when we discuss the role of multi-homing in shaping platform competition.

Armstrong (2006) considers duopoly competition between platforms that sell a consumption good with network effects. The goods sold by the platforms are subject to two-sided network externalities but also provide intrinsic values to consumers. There are two populations interested in the good who care about the other side’s demand for the good they buy. Preferences over the two goods are dispersed and, on each side, some agents prefer one good and others prefer the other good: the goods are therefore horizontally differentiated. When the extent of differentiation is large relative to the intensity of network effects, some users will prefer to buy their preferred good so that both platforms will coexist. This doesn’t mean that the existence of network effects has no impact on competition. Nevertheless, it is assumed that these network effects are less important than the differentiation aspect so that there is always room for two platforms on the market.
More precisely, this is modeled by assuming that agents on both sides have an intrinsic preference for either platform A or B, and they will have to choose only one. Any agent from side 1 registered on platform A will benefit from the presence of every agent from side 2 on the same platforms. Therefore, the competitive landscape is shaped by competition for attracting people on one side in order to appear more attractive on the other side (in the same spirit as in Caillaud and Jullien, 2003). The way preferences are modeled by Armstrong is by means of the so-called Hotelling model. This model assumes that on each side, agents are diversely located on a line segment and their preferences are determined by their distance to the two platforms, located at the two ends of the segment. This means that some consumers, because they are located close to the platforms, are naturally attracted to one platform (so network effects are not important for them); whereas other consumers, located at the middle of the segment, do not have a natural platform to register to (so network effects matter to them).

The core of Armstrong’s contribution is to characterize the equilibrium prices set by the two platforms, and the role of network effects in shaping these prices. As usual in settings with imperfect competition, the price results from a trade-off between margin and quantity. And the impact on quantity is measured by the impact on marginal consumers (that is, the consumers who are indifferent about buying from one platform or the other). As said before, the marginal consumers are the ones to whom network effects matter the most. So the question raised by this contribution is how network effects change the marginal reaction to price, hence the demand elasticity. The key insight of Armstrong (2006) is that indirect network effects tend to increase the elasticity of demand perceived by each platform on both sides of the market. Higher elastic demand means that increasing one price induces a higher loss of sales on both sides of the market. When a consumer on side 1 leaves the platform, network externalities are reduced on the other side, inducing lower demand on side 2; and, by a feedback effect, lower value and lower demand on side 1. As a consequence, firms refrain from increasing prices and competition is more intense. To put it differently, there are three reasons for a platform to attract a new customer. First, this platform can earn a markup, as in any market. Second, it increases the price the platform can charge to the other side, because of higher network effects. Third, it reduces the attractiveness of its competitor for which the customer was formerly its client, due to lower network effects on the competitor’s platform. Let us develop further the equilibrium price formula. In the benchmark case with single-homing and rational expectations by consumers – that is, any agent perfectly anticipating how the other agents will be allocated at the equilibrium between platforms A and B – the price equation is as follows.
Note that each platform must set two prices simultaneously. Since the price on side A influences how many agents will join on that side, and therefore, the value for any agent from the other side to join the platform, these prices cannot be considered as being set independently from one another. Armstrong (2006) has shown that one way to proceed is for a platform to set the profit-maximizing price on side 1 while adjusting the price on the other side to maintain demand constant.

In the general pricing formula set above, we can be more precise about each term on the right-hand side. First, the markup depends on the price elasticity of demand. In the Hotelling model, this amounts to the parameter that measures the platforms’ heterogeneity or the differentiation parameter between agents. Second, the cost per user is a technical characteristic which is assumed to be constant in the main model but can be variable with no major impact. Third, the value created when an additional user joins the platform. This value depends on how users from the other side value this side and on the number of agents on the other side. The more agents on the other side and the higher the externality generated, the larger the value created and the lower the price. The last term represents the value lost for the competitor. It is equal to the externality this agent was generating on all the agents from the other side that were on the competing platform. Another way to think about this pricing formula is to consider any cost that a new consumer generates for a platform. There are technical costs and opportunity costs. The technical cost is just the direct cost induced by consumption. The opportunity cost represents additional loss incurred due to opportunities destroyed or created by consumption, and in the case of a platform it is negative because the customer creates value for the platforms. The value generated by the externality on the platform as well as the value destroyed for the platform’s competitor is exactly the (negative of) opportunity cost of a marginal user. In short, competition between platforms can be quite intense because each agent is also an asset in the competitive process. The higher the value this agent generates for the agents on the other side, the more platforms will compete to get the agent on board and therefore lower the price.

Note that Armstrong’s analysis is restricted to the case where there are two platforms and two sides. But the intuition is more general. As long as network effects are not too large, Tan et Zhou (2017) showed that the pricing formula derived by Armstrong can be generalized to the case where there are many more sides and many more platforms. Of course, this means that any agent gained on one side generates some externality on many more potential agents – as there are many sides – and on many
more competing platforms. But in a context where each platform is small, the intuition (and even the formula in the symmetric case) remains the same as the one derived by Armstrong (2006).

As explained earlier, the possibility of competition on the market relies on the presence of heterogenous standalone values, as network effects alone tend to generate tipping. But it is often quite difficult for an agent to guess how other agents value each platform. This raises the question of how we can account for this uncertainty about the others’ preferences and therefore their willingness to join one of the platforms. This issue has been studied recently by Jullien and Pavan (2018) in a model that shares many features with Armstrong (2006). There are two platforms, two sides, some cross-side externalities, and single-homing. The additional twist comes from the fact that agents can have different beliefs about other consumers’ preferences and therefore about the number of people who, for given prices, could join the other side. To put it differently, it is assumed that the average preference in the population is unknown and can favor either platform. And each agent will use his own taste parameter to update his belief on this average preference and guess likely participation levels on each platform. Jullien and Pavan (2018) consider two cases, depending on whether consumers’ preferences on the two sides are positively or negatively correlated. If they are positively (respectively negatively) correlated, then the higher a consumer’s own standalone value for a platform, the higher (respectively lower) the consumer will expect the others’ standalone value to be for this platform.

In this setting, platform competition leads to a price equation very similar to the one obtained in Armstrong (2006). Indeed, there is the standard effect of the demand elasticity on the markup and the impact on the other side of the market. But a new term emerges to account for the belief agents form when observing their own type. This term can lead either to higher or lower prices. Let us consider the case of aligned preferences (positive correlation of preferences across sides). In this case, an agent from side 1 with a strong preference for a platform anticipates that many agents on the other side will also have a strong preference. Any price increase on that side will discourage the weakest-preference consumers from buying and thereby increase the standalone value of the new marginal agents, making these agents on that side more optimistic about the other side. Because they are most optimistic, they are more willing to accept this price increase. In other words, in the case of aligned preferences, the demand elasticity is lower when consumers are uncertain about demand. Each platform can set higher prices. And the reverse holds when preferences are negatively correlated. A consequence of these findings is that, in the simple case of single-homing, platforms can alter the intensity of competition by manipulating the information flow to consumers.
Coordination and market beliefs

One of the key difficulties when firms compete with network effects is that the market outcome is shaped by consumers’ beliefs about participation on each platform. In this respect, competition with network effects differs from competition with returns to scale. While in both cases the mean value of trade increases with size, consumers’ expectations matter only when this is induced by demand externality rather than cost externalities. This has raised numerous difficulties in modeling competition with externalities. Two main questions arise in this context, the first related to coordination and the second to information.

Coordination issues arise when there are multiple equilibrium allocations of consumers across platforms and the way the equilibrium is selected affects the market dynamics. Focality or incumbency advantage is an illustration of this issue. In this case, consumers’ expectations tend to advantage one platform over the others which may lead to excess inertia or excess momentum. However, markets can coordinate in different ways. For instance, many authors assume away coordination failures by focusing on allocations that are optimal from consumers’ perspective or by simply assuming that platforms are able to choose quantities on each side of the market (see Rochet and Tirole, 2006). Weyl (2010) and Weyl and White (2016) argue that platforms have enough pricing instruments to overcome the coordination problem. They define an equilibrium concept, insulated equilibrium, based on the idea that prices are designed in such a way that participation on one side is not affected (at the margin) by participation on the other side. While solving coordination issues may favor economic efficiency and reduce barriers to entry, it may not benefit consumers because coordination failure may protect them against excessive use of market power. To illustrate this, consider a monopoly platform facing “unfavorable beliefs”. Consumers will benefit if the platform must subsidize participation on one side to overcome the coordination issue. If instead consumers coordinate in the most efficient manner, the platform can extract all the surplus from consumers by charging high prices on both sides because consumers expect others to participate.

The second issue relates to consumers’ information and demand elasticity. This was illustrated by the work of Jullien and Pavan (2018) on consumers’ beliefs and information. As consumers must anticipate participation on the other side, the equilibrium depends on how these expectations are formed. The most prominent view (Caillaud and Jullien, 2003; Rochet and Tirole, 2003) is that when prices change, consumers adjust their beliefs and correctly anticipate the participation on the other side (referred to as rational expectations). This view emphasizes the role of feedback effects between sides and may prevail if demand adjusts fast. However, an alternative view is that consumers hold fixed beliefs about the other side’s participation that do not vary when prices change (although beliefs are assumed to be correct at equilibrium market price). Because this approach assumes less internalization of network externalities by consumers, it leads to less elastic demands and thus to higher equilibrium prices (see Hagiu and Halaburda, 2014). The same remark holds for the Cournot assumption that firms choose volumes on each side and volumes are correctly anticipated by consumers.

So far, we have focused on the case where firms have similar business models and follow similar strategies. In this case, the firms’ source of profit is differentiation in each platform’s products.

When horizontal product differentiation cannot be achieved through product design, alternative strategies may be deployed to relieve competitive pressure. Typically, this takes the form of adopting different business models. Adopting different price skewness to court different segments from competitors on each side of the market is one way to propose a different value than competitors. An illustration is provided by the contribution of Ambrus and Argenziano (2009). The authors want to investigate the condition for the existence of asymmetric networks, as is the case, for example, in the market for online job search in the US or in the credit card industry. Even if networks are ex-ante
identical, consumers value the network effects differently, some caring more about the externality than others. Because of this heterogeneity, it is reasonable to have more than one network (owned by the same firm or by different firms). And each network will have a different strategy on each side of the market, which will generate an endogenous differentiation. More precisely, let us assume that on each side, there are two types of consumers, some who value large networks highly and a large mass of others who have a low valuation for large networks. Each platform’s optimal strategy is to set a low price on one side (1 for example), in order to attract the large mass of consumers with low valuation and set a high price on the other side (then 2). If one platform proposes low prices on side 1 and high prices on side 2, the other platform should do the opposite and propose low prices on side 2 – because there are many agents still free – and high prices on side 1 – for the consumers who value being connected to many agents from the other sides. For illustration, in the case of online job search, there will be two active platforms, one with more job posts and the other with more job candidates.

Another alternative to differentiate from the competitor is to adopt a business model that is attractive to some consumers. Calvano and Polo (2018) study this possibility in the media market. They want to explain the co-existence of outlets with opposite business models: Free-to-Air (FTA) and Pay-TV. Instead of relying on users’ heterogeneity of preferences, they argue that this can be explained by strategic considerations. They show that if one media outlet chooses an FTA business model, the other has some incentives to choose the Pay-TV business model. For this, they propose a model in which two media outlets offer content and advertising services to a group of identical viewers on one side and identical advertisers on the other. Viewers have two units of attention, they like diversity, but value negatively the presence of ads, whereas the media display some partially substitutable content. Every advertiser benefits from more viewers and they must choose how much and where to display their ads. The media will gain some revenue by making viewers and advertisers pay. It is assumed that the media control the total amount of ads on their outlet, then choose the price for viewers and advertisers accordingly. Viewers and advertisers then choose where to register.

The main result of this paper is that competition will lead to some differentiation across media. When one station increases the level of advertising and reduces the viewers’ subscription fee, it induces the other station to do the reverse – that is, to decrease the level of advertising and increase the viewers’ subscription fee. This comes from the fact that the two media are substitutable channels for conveying the same advertising content when consumers view the two outlets (for more on this, see the section on multi-homing below). The value of pursuing the same strategy is therefore reduced. Conversely, if one
station decides to reduce its advertising content, the other station becomes the only way for some advertisers to catch the viewers’ attention, increasing its incentives to display some ads.

More globally, the amount of advertising induces a trade-off between increasing the price for advertisers and decreasing the price for viewers. Even if there may be some cases where all media choose the same strategy – say, when only one side is valuable – there are other cases where media platforms are better off choosing different strategies.

So, even if both sides are ex-ante identical, there can be some strategic reasons that lead to product differentiation, explain the co-existence of several platforms, and drive the nature of competition in the market.

Platform Competition and Privacy

Most models focus on price competition. But firms can also compete in other dimensions on the internet. Casadesus-Masanell and Hervas-Drane (2015) propose an analysis in which firms provide the same basic service and then compete on price and information disclosure. The level of disclosure chosen by the firm – the privacy policy – is observable ex ante by consumers and plays the same role as a quality parameter. Because the service sold by the firm is the same, if both firms choose the same level of disclosure, competition drives profits to zero. Firms can instead opt for different levels of information disclosure, thereby achieving a vertical differentiation of their products. More precisely, one firm engages in a high level of disclosure and, as a consequence, tends to subsidize consumers, whereas the other opts for a low level of disclosure and charges positive prices. This article shows that, even if firms provide the same service/goods, the choice of different privacy policies induces some vertical differentiation and allows them to make a profit. It also shows that different possible models (paid/free) can co-exist in the same internet market.

b) Multi-homing

The previous contributions share the important assumption that each agent could only join one platform. This assumption of single-homing is far from being realistic in all cases. Sometimes, people use more than one search engine, post and read on many social networks, or have more than one credit card. How robust are the ideas developed above to the possibility of multi-homing?

Let us discuss this question using again the model developed by Armstrong (2006) but assuming that one side, say side 1, still single-homes while the other side, therefore side 2, wants to join both platforms. This multi-homing behavior dramatically changes the competition between platforms. As far
as side 2 is concerned, the agents make their choice to join each platform separately. Given that a side-2 consumer can join both platforms, there is no more direct competition to attract consumers from this side.\(^6\) This lack of competition has the immediate consequence of changing the bargaining power between the agents and the platform. To understand this, one must realize that because each side-1 user single-homes, the user is a scare resource for which each platform is ready to fight. And if any side-2 agent wants to be connected to a specific agent from the other side, they have to join the platform this specific agent has joined. In this case, the platforms act as competitive bottlenecks. Consequently, they will raise their price on side 2, leading to too few of these agents on their networks. As far as the price on side 1 is concerned, it is more ambiguous. On the one hand, the value destroyed for a competitor by attracting some of its side-1 customers does not transform into a competitive edge on side 2 since there is no direct competition anymore. On the other hand, the value generated is larger because of the double market size. The surplus gained by one side depends on its price but also on the price set on the other side, through the impacts on the number of agents. Therefore, the single-homing side can benefit or lose from the introduction of multi-homing on the other side (see Belleflamme and Peitz, 2019).

This issue of multi-homing vs. single homing is, in fact, crucial to understanding properly how platform competition takes place. The original contribution of Rochet and Tirole (2003) provides a useful set-up for this. The motivation for this work was to better understand competition in credit-card markets but many insights are general and apply to most cases of platform competition. Rochet and Tirole (2003) consider a situation in which some platforms intermediate trades between two sides: buyers and sellers. Each agent from each side has a private benefit from trade using one platform or the other. In contrast to Armstrong (2006), the price paid by each agent is only a transaction fee, and not a subscription fee. Still, even if the meaning of single-homing or multi-homing differs from the above case, one can discuss how competition on each side influences the nature of competition in this market.

More precisely, sellers would prefer to trade on the platform that sets the lowest price whereas buyers have some preferences towards one or the other platform. The two sides must make different types of choice. As far as buyers are concerned, they decide first whether to consider using potentially both platforms. Some will be ready to use both, because their preference for the platform is weak, whereas

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\(^6\) In Armstrong's analysis, multi-homing eliminates all direct competition because marginal consumers of one platform would join the other platform in any case. A more balanced view emerges when multi-homing is driven by disparity in individuals' valuation of network externalities. Then some marginal consumers multi-home while others single-home so that there is still some direct competition but less than without multi-homing, and the qualitative conclusions are similar (see Doganoglu and Wright, 2006).
others only consider using one of the two platforms. Therefore, the former are called multi-homers whereas the latter are single-homers. On the sellers’ side, they must decide whether they are ready to accept trades on both platforms (that is, if they are willing to propose their goods on both platforms). If they are, the platform on which the trade is made depends on where the buyers decide to buy. If a seller chooses to join one platform only, the one that sets the lowest transaction fee, it limits the number of potential trades (because some consumers will refuse to trade on this platform) but increases the average markup as the seller will realize all its trades on the cheapest platform.

How are the prices set by the platform on both sides? The general features are quite like the one derived in Armstrong (2006). Indeed, the price on one side depends on the cost, on the externality generated on the other side – that is, the price that can be collected with an additional trade – but also on the elasticity of demand. Let us look more closely at this element. As far as buyers are concerned, this elasticity has a classical form in that it depends on the price and on the consumer’s preference toward one platform or the other. It is more interesting to study how platforms set their prices for sellers. For this side, let us assume that a seller has already joined platform A. This means that this seller was able to trade with all the buyers on this platform. If the seller also joins platform B, this increases the number of potential trades even more because some buyers are only on that platform. To put it differently, the more buyers are loyal to a platform, the more it pays for a seller to join this platform. Therefore, the price this platform will be able to charge for this seller increases in relation to the percentage of loyal (or single-homer) buyers.

This contribution offers a flexible way to think about single-homing or multi-homing in the context of platform competition. More than an ex-ante choice to join one or two platforms, this property is the result of the combination of exogenous factors (the preference for one platform or the other) and endogenous factors (such as the prices set by the platforms). It also highlights the general idea that platform prices targeted at multi-homers are set in proportion to the incremental value generated by the platform, while prices targeted at single-homers are set in proportion of total value. This incremental value for multi-homers is the additional value brought to them by a platform, given that some of its value may already be provided by the other platform products. In Caillaud and Jullien (2003), this incremental value was the maximal profit the entrant could gain in a setting where multi-homing was efficient. In media markets, or in the context where some advertisers constitute one side of the market, this value is the gain attached to the possibility that a user is exposed to an ad that the user had not viewed before (see Anderson et al (2017)). Similarly, the incremental value of joining several social networks may lie in the
ability to reach more friends, different content focus and privacy concerns. This incremental pricing principle is at play in most models of platform competition and explains why the issue of single-homing vs multi-homing must be accounted for.

Media Market and Competition for Attention

The media market is a natural application of two-sided markets. In the now classical approach developed by Anderson and Coate (2005), two channels A and B compete for viewers and are financed by advertisers. Advertisements inform viewers of the nature and prices of some new good. In this setting, the amount the advertisers are willing to pay depends on the selling price of the good advertised and on the number of viewers on the platform. As for viewers, they dislike ads but enjoy the programs displayed on the channels, some of them preferring A and others B. Increasing the level of advertising allows the firms to sell more goods – a benefit – but may lead viewers to switch off or choose to watch the other channel – a cost. Platforms choose the volume of advertising and set a price per viewer accordingly. Because it is assumed that viewers choose only one channel, there is competition for exclusive attention, whereas firms want to advertise on both channels. Competition for attention leads to a decrease in the quantity of advertising compared to a case where both channels are owned by the same firm. Indeed, advertising plays the same role as a price that consumers must pay to access the channels. With more competition, channels are forced to lower this “price”, that is here the level of advertising.

When viewers multi-home (as in Ambrus et al., 2016), they are shared between platforms and have less value than exclusive viewers. It is harder for a channel to extract the full value from firms as viewers may have been already informed by advertising on the other channel. The incremental value being lower with shared viewers than with exclusive viewers, the price channels can set is reduced. In this setting, the impact of competition is ambiguous. On the one hand, the value of an ad is lower with competition, leading to fewer ads. On the other hand, each viewer has less value so competing channels are less reluctant to lose one, leading to more ads. Note that the fact that viewers multi-home, and the desire for advertisers to avoid inefficient duplication or loss of potential consumers, gives a competitive advantage to large platforms and those using tracking technologies (see Athey et al., 2018).

V. Competition policy

As platform markets tend to be concentrated, they have attracted considerable attention from anti-trust authorities. Indeed, cases involving platforms have been among the most prominent over the past 20 years. However, the record of anti-trust enforcement regarding platforms is mixed. While authorities have successfully challenged some alleged anti-competitive practices – for instance, price-parity rules or tying – many observers point to weak merger policy and other difficulties in addressing issues related
to platforms. Here we highlight some specific aspects of platforms that may call for adjustment of competition policy.

At the general level, the difficulty comes from the lack of a proper competitive benchmark for activities involving large demand externalities, such as those induced by network effects. Without demand externalities, perfect competition provides the normative benchmark toward which policy should aim. This is because prices in this scenario reflect cost and guide the choice of consumers toward efficient consumption. In other words, prices act as a signal that allows consumers to internalize the social cost of their consumption. However, with demand externalities, the production cost of a good is not the relevant signal to consumers as it doesn’t induce consumers to “internalize” the effect on other consumers in their own consumption decisions. Hence, the benchmark of perfect competition does not correspond to maximal efficiency of trade.

This raises a fundamental issue for competition policy, in particular merger policy, as competition may reduce welfare by inducing excessive fragmentation and insufficient consumption. Moreover, a firm with market power may induce a price structure that is more efficient than a competitive environment.

We now discuss in more detail some specific aspects of competition policy. We will not try to be exhaustive as some platform practices have been widely commented on (price-parity clauses, for instance, or the agency model distribution), and we will focus on what is new about platforms that does not apply to more traditional markets. Of course, this does not mean that traditional analysis of anti-competitive practices never applies to platforms; it often does.

After discussing the market power of platforms, we will examine the following issues: exclusionary pricing and predation, exclusivity, bundling, vertical foreclosure and collusion. We will end this section with a discussion of mergers between platforms.

a) Market power

A first difficulty is to identify the extent of market power. In the traditional analysis of oligopoly, market power is identified by a large markup over cost. But we have shown that platforms may exhibit strong price skewness with some sides being charged low or zero prices and others being charged relatively

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7 See Crémer et al. (2019) and Scott-Morton et al. (2019) for reports on EU and US anti-trust, and Argentesi et al. (2019) for a report on UK merger policy.

8 The relevant prices that consumers should face for efficiency are referred to as Lindhal prices and they are complex to implement and hardly measurable.
high prices (see Rochet and Tirole 2006 for a discussion of price skewness). This implies that observing a high markup on one side of the market need not reflect strong market power in the platform activity, just price skewness. This was illustrated by the model of the competitive bottleneck where firms charge a high price on the multi-homing side but may compete away the profit on the single-homing side. Thus, when looking at margins, the whole structure of margins across all sides should be considered and not only one side. The competitive bottleneck also illustrates that there are several levels of market power. A platform that has secured a large base of single viewers who are not active on other platforms has some form of market power over advertisers (thus in the market for attention of its unique viewers). In this respect it has gained (on merit) some market power over the advertising side. But this doesn’t mean that it can exploit and appropriate the surplus as it may have to compete harshly to capture and retain its viewers. In this case the rents extracted from advertisers may be redistributed to consumers, who ultimately will be the beneficiary of market power.

A counterpart is that a low price also need not reflect a competitive environment as it may result from high network benefits generated by the side under consideration. Even if one identifies market power despite low price, the question of the exercise of market power remains. Market power is a capacity, not a behavior. In most industries, the capacity to exercise market power implies exploitation of this market power as it is the sole source of profit. But platforms have multiple sources of revenue and may choose not to exploit their market power if the resulting large participation induces large profit on the other side, or at least if it is larger than the foregone profit.

These two insights – that high markup on one side need not imply high total profit, and low markup need not reflect competitive pressure – result in difficulties with market definitions. Platforms are typically active in several markets and demands are interrelated. This market interconnection is due to two factors. First, multi-sided externalities imply that demand on one side depends on demand on the other side, and this has to be factored into the market definition. Second, large platforms offer different services to each side so that, even on just one side, several markets may be affected by platforms’ exercise of market power. Once connected to a user, digital platforms can leverage economies of scope to expand their activities and many aim at building a one-stop ecosystem for consumers. Estimating demands in this context is more complex than in more standard industries but ongoing research is developing and providing the technical tools to do so (see, for instance, Argentesi and Filistrucchi, 2007).
A more subtle issue is the definition of markets and the tests to delineate them (the interested reader may consult the report on market definition by Franck and Peitz, 2019). When setting the framework for evaluating an anti-competitive practice, authorities will have to decide on whether they define one market for the platform activity or separate markets for each side. Moreover, they will have to decide how to account for markets’ interconnections in the analysis. Typical market definition is guided by the so-called SSNIP test, which consists in evaluating whether a coordinated increase in the prices of several products by several firms would be profitable. This allows authorities to identify the products in the relevant market. These tests need to be adjusted to account for feedback effects between different sides of the market and there are several ways to achieve that, depending on the adjustment made on the other side of the market when evaluating effects of price increases (see the discussion in Evans and Noel, 2008, or Franck and Peitz, 2019). Depending on the choice made, markets may be more or less narrowly defined, which may have significant effects on anti-trust enforcement.

Another technical issue is gratuity on some sides of the market. From an economic perspective, the fact that a service is free of (monetary) charge does not mean that it is fundamentally different from other services. It is just a service for which the price is zero rather than 2 or -2. Typically, as we have seen, a service is free of charge when the platform would be willing to subsidize participation because it can monetize this service in a different way and negative prices are in general not sustainable (fidelity points for credit cards are among the possible exceptions). In this case, there is an economic exchange at zero price, which doesn’t preclude competition for consumers and substitutability between free platform services. But in practice, gratuity raises the level of complexity of the analysis for two reasons. First, when a service is free, monetization occurs with some third parties (advertisers in particular) so that understanding the nature of competition requires accounting for the full value chain with multiple parties rather than just the bilateral relation between the platform and its customers, as is the case for a simple producer-consumer relationship. Second, the locus of competition for consumers shifts from prices (that are easily observable) to non-price competition, in particular quality of service and privacy intrusion. Quality of service is complex to measure because, unlike prices, it is rarely observable and heterogeneous across consumers. To our knowledge, there is currently no well-established measure of quality and this will need to be done on a case-by-case basis.
b) Exclusionary pricing

From the early development of models of two-sided markets, it has been claimed that observing a price below cost on one side should not raise a presumption of a predatory attempt to exclude competitors. Price below cost may result from consumers generating large network externalities and be motivated by pro-competitive considerations. The literature has shown that competition may exacerbate price skewness as firms compete to attract the most valuable consumers. As a consequence, observing price below cost may be the sign of active competition and may not raise anti-trust concern. This view raises two issues, however: one related to the potential exclusionary effect of strategies involving prices below cost; and another related to enforcement of anti-trust policy.

Regarding exclusionary effects, the question is whether below-cost pricing may result in socially sub-optimal entry. However, the literature has shown that there is no simple answer to this question and that it depends on the precise context. It is known at least since Farrell and Saloner (1986) that competition in network industries can lead to insufficient or excessive entry. In the context of two-sided markets, a corollary of the analysis of Caillaud and Jullien (2003) is that below-cost pricing may help an incumbent to preserve its market faced with an entrant, provided it is not too efficient. In other words, below-cost pricing may allow leveraging an incumbency advantage by raising the cost of entry. A recent contribution along this line is Karlinger and Motta (2012) who show that when a critical size is necessary to generate network externalities, an incumbent may exploit consumers’ lack of coordination and preserve its monopoly position by targeting a group of users with very attractive offers. However, this protective role of below-cost pricing is countervailed by the flexibility that divide-and-conquer strategies provide to new entrants in building market share. An entrant may be willing to price below cost as well if the induced participation allows it to secure a profit on another side of the market. Unlike in the case of pure intermediation services (Caillaud and Jullien, 2001 and 2003), Jullien (2011) concludes in a model combining incumbency advantage and divide-and-conquer strategy that when network externalities are small, there may be either excessive entry or excessive market fragmentation. Faced with a more efficient entrant that has the ability to target any side of the market with a subsidy, the incumbent cannot protect itself because a defensive strategy that subsidizes one side is vulnerable to an entry strategy that subsidizes the other side. Moreover, even when possible, the cost of protecting its monopoly position on all sides of the market may be so high that the monopoly prefers to accommodate partial entry by letting the entrant sell to one side but keeping on selling to the other side. In this fragmented case, all network externality potential benefits are wasted. A similar conclusion of excessive entry is
reached by Vasconcelos (2015) in a model of entry where the incumbency advantage is due to the incumbent’s installed base of locked-in consumers on both sides of the market.

The overall conclusion is thus ambiguous, and it is that below-cost pricing may or may not have exclusionary effect. In this context, exclusionary concerns may be of limited importance.

Previous contributions have focused on the outcome of static competition between two platforms in the market. Another issue with below-cost price is the possibility of predation by a dominant platform. Standard theories of predation apply to platforms as well as to any other firm (see Bolton et al., 1999, for a review and discussion). For instance, a platform could develop a reputation of aggressiveness toward entrants that discourages future potential entrants. In this case, the main issue is not the underlying economic analysis of predation but rather the relevant tests for enforcement. The actual approach to predation is based on the Areeda-Turner rule that compares actual prices with average cost (as a proxy for marginal cost) to establish whether a firm is making a “sacrifice” of current profit for future gains, presumably due to the eviction of a competitor. The difficulty is that platforms’ prices are naturally skewed so that such a test may fail on two grounds: it may wrongly impute a sacrifice and it may miss some above-cost predation. One possibility to extend this approach is to consider the pricing formulas for competition in the market discussed in the section on competition in the market. There, we have shown that the prices follow a standard markup formula but where the costs must be adjusted for any opportunity cost. Hence, the relevant “marginal cost” on one side is equal to the cost net of any revenue that a customer on one side allows the platform to generate on the other side. Defining the relevant marginal cost this way would provide a partial competitive benchmark for efficient pricing on each side, with the difficulty that this benchmark depends on the platform’s behavior on the other side of the market. Based on this insight, Berhinger and Filistrucchi (2015) propose and discuss an extension of the Areeda-Turner rule that has two novel features. First, given that the market involves two sides and two prices, there are two tests, one for each side. Second, each test accounts for the margin on the other side of the market and cross-side demand externalities.
c) Exclusivity

Armstrong and Wright (2007) were the first to point to the possibility that two-sided platforms use exclusive dealing as a way to prevent multi-homing. Preventing multi-homing is profitable for a platform because, as we have seen, multi-homing on one side of the market reduces the revenue that a platform can obtain on the other side of the market. They analyze several models and show that the possibility of offering exclusive contracts destabilizes equilibria where agents multi-home on one side. In particular, they consider an extension of the model of Caillaud and Jullien (2003) of pure intermediation where a competitive bottleneck equilibrium exists in the absence of exclusive contract. In such an equilibrium, agents on one side single-home while agents on the other side multi-home. Profits are generated by charging high prices for multi-homers to access single-homers, but part of these profits is dissipated through competition for single-homers. When a firm can offer exclusive contracts, it can destabilize the equilibrium by proposing exclusivity to multi-homers, thereby monopolizing the other side of the market at high price since the competing platform has lost its value. In this model, they show the existence of a tipping equilibrium where only one platform is active. Moreover, consumer surplus is lower in the tipping equilibrium compared with the competitive bottleneck because the active platform reaps all the monopoly rents.

Carroni et al. (2019) further develop the analysis of exclusivity by noticing that an exclusive contract with an agent generating large externalities on the other side of the market (a superstar) may also convince other agents on the same side (say sellers) to stop multi-homing and join the platform exclusively. This is because the exclusivity of the superstar reduces the value of the competing platform and thus induces a shift in demand on the other side of the market (consumers) toward the superstar platform. Relative to the option of single-homing with the superstar, the option of multi-homing thus becomes less attractive for sellers (the incremental value of the competing platform decreases). More sellers single-home on the superstar side, which attracts even more demand on the consumer side, and in return more sellers single-home. This induces a virtuous participation circle for the platform gaining exclusivity of the superstar that allows it to raise its single-homing demand on both sides of the market. However, gaining this exclusivity is costly as the superstar needs to be compensated for lost interactions on the competing platform. Carroni et al. (2019) conclude that exclusivity will emerge if the intensity of competition is strong on the consumer side and that this may benefit small sellers and consumers.

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9 There are of course other motives for exclusivity not specific to platforms that we do not explore, such as protecting specific investments or preventing free riding.
because the seller’s participation increases, and larger network externalities are generated. Thus, even if exclusivity may lead to tipping, it will not necessarily reduce social welfare.

Another concern with exclusive contracts is that they may be used to protect monopoly power and exclude potential competitors. In particular, it is well known that exclusive dealing may be used to raise barriers to entry when there are increasing returns to scale within the market (see Rasmusen et al., 1991, and Segal and Whinston, 2000) or across markets (Bernheim and Whinston, 1998). Given the similarity between network externalities and returns to scale, the same may occur in platform competition. Doganoglu and Wright (2010) confirm this insight by showing that an incumbent can prevent entry by signing exclusive dealing agreements with a critical mass of agents on one side of the market and it may benefit from doing so. They consider two competing sellers of network goods, assuming that one firm (the incumbent) can make introductory offers to a subpopulation of consumers before price competition starts. When agents can multi-home and exclusive dealing is not possible, an entrant of superior quality always succeeds in conquering the market. In this case, the introductory offers are inefficient at protecting the incumbent’s position because buyers of introductory offers can multi-home afterward and will do so if others buy the entrant’s product. Things change when the incumbent can make exclusive introductory offers. In this case, the incumbent will secure exclusive participation of a critical mass of users with exclusive introductory offers. This allows the incumbent to sell its products at a relatively high price to all other users, who seek the network externality induced by the exclusive consumers. As all users buy the incumbent platform’s product, the more efficient competitor has to contend with inducing multi-homing by setting a low price for the incremental benefit of higher quality for the consumers. As a result, entry is impeded and occurs at a suboptimal scale.

Things change if we consider the possibility that the entrant also makes introductory offers. As pointed out by Evans (2013), exclusivity may improve efficiency by helping a platform to improve coordination on the most efficient platform. A recent study by Markovichy and Yehezkel (2019) further investigates this question in the case of a user-group, i.e. an institution coordinating the choices of a group of users (such as a cooperative, an investment fund or a bank adopting a credit card). In their model, as in Doganoglu and Wright (2010), platforms first compete for the user-group, then for the individual participation of other users. Both firms can make initial offers but due to an incumbency advantage, a new entrant with a superior product faces the difficulty of coordinating the consumers on its platform and overcoming the barriers to entry. The possibility of introductory offers to the user-group alleviates the difficulty and facilitates entry if this group is able to induce a bandwagon effect that attracts other non-
coordinated users. However, when the group participates on both platforms (hence under non-
exclusive), the effect is limited because it is rather difficult for the entrant to convince the incumbent's 
customers to buy its products. By contrast, if the participation of the user-group is exclusive, then 
attracting the group allows the entrant to gain a competitive edge and win the market. The entrant will 
then offer attractive conditions to the group with a subsidy, reflecting the profits from other users, and 
efficient entry is more likely. However, while exclusive offers facilitate entry, this does not eliminate all 
barriers to entry because the incumbent may still subsidize the user-group to continue buying its product 
and preserve its monopoly position.

A reading of the literature on exclusivity is that, while it can still be exclusionary, it raises less concern in 
the case of platforms than in the case of dominant traditional firms. Even if it does not directly bring any 
efficiency gains, exclusivity may be profitable for a competitive firm because it improves its position on 
the other side of the market. Thus, it need not be motivated by the exclusion of competitors but rather 
by current maximization of profits. Moreover, in this case it is difficult to say whether it improves or 
harms welfare. Still, when entrants face difficulties in convincing consumers to buy their product, due to 
coordination failures, exclusivity may be a powerful tool to block entry.

\textit{d) Bundling}

Bundling refers to the practice of selling several goods together in a bundle. It is said to be pure when 
goods are only available together, or mixed when the bundled goods are also available separately. Note 
that the former case is sometimes called tying. Bundling is a common and well-known phenomenon on 
the internet. The prominence of bundling in information services relates in part to the fact that these 
services incur very small variable costs.\footnote{See Bakos, Y. and E. Brynjolfsson (1999).} As platforms benefit from economies of scale and economies 
of scope, there is very little cost in using a platform to offer a service to all the population rather than a 
targeted sub-population. In this context, it may be more profitable to offer all the services in a bundle 
with a single total price, rather than setting a price per service and letting customers choose which 
services they want.

Traditional economic analysis identifies two broad categories of motives for bundling. The first category 
relates to price discrimination, while the second relates to exclusionary practices. Price discrimination is 
achieved by proposing several bundles targeted at the preferences of different groups of consumers.
Depending on the context, it may benefit some consumers and hurt some others. It may help to reach consumers that would not otherwise join (a pro-competitive effect) or allow higher prices for some consumers with particular needs. Exclusionary motives are grounded in the fact that sellers of independent goods or services may have difficulties competing against a bundle. The prospect of low profitability may then discourage entry in some services of the market, which may help a firm with market power to monopolize a potentially competitive service (Whinston, 1990) or to protect its market power in its core activity by preventing entry in complementary activities (Choi and Stefanadis, 2001).

While traditional analysis extends to platforms, there are also some specificities that we will now discuss. We start with a contribution related to discrimination in that bundling allows platforms to change the prices faced by different types of users. Amelio and Jullien (2012) point to the fact that one additional motive for multi-sided platforms is the willingness to raise the value for consumers when the service is free of charge. Adding an additional service to free services amounts to selling a larger bundle at zero price. As we have seen, zero prices occur in a two-sided market when the platform would be willing to set a negative price but cannot do it for practical reasons (either technical or because of consumers’ opportunism). Adding goods or services in the free bundle is then a way to raise the subsidy to consumers and boost demand. This is optimal when the increased participation raises the network externality on the other side of the market which allows the platform to raise prices on this other side. In the context of a two-sided market, Amelio and Jullien (2012) identify conditions for a monopoly or duopoly to set a zero price on one side and investigate the consequence of allowing a platform to bundle the service with another good, thereby raising the value of participation on the free side. They show that bundling by a monopoly platform is pro-competitive as consumers on the free side benefit from higher utility of the bundle while consumers on the other sides benefit from higher externalities, provided that the pass-through rate is less than one.11

In a competitive context, the analysis of the implications is more complex when only one platform is able to offer a bundle. Bundling by one platform shifts demand on both sides of the market toward this firm but it also weakens the intensity of competition on the pay side. The reason is that additional paying consumers attract, through the two-sided network effect, additional free consumers who are costly to the platform. Bundling is thus a costly way to raise the value offered to paying consumers, and the higher costs result in less competition. As a consequence, bundling by both platforms reduces total consumer welfare because the demand-shifting effects for each platform cancel each other, hence network

11 The pass-through rate measures the fraction of increased value that is captured by the price increase.
externalities stay the same, while prices increase on the pay side. When only one platform can propose a bundle, the analysis shows that it may not be profitable to do so if this makes the other platform too aggressive in preserving its market share, and it may hurt or benefit the competing platforms due to competition softening. Their general conclusion is that bundling “raises total welfare [in] situations with large externalities and strong competition”.

Choi and Jeon (2018) further clarified the interaction between pure bundling, that is tying, and gratuity in the context of the market for attention where a firm bundles the good with in an independent, free, ad-financed service. Their key point is that when services are free and financed by advertising, tying a free service cannot trigger an aggressive reaction by a free-service competitor as this competitor is already constrained by non-negativity of prices. The aggressive reaction of competitors trying to preserve their market share is one of the main reasons why tying is often not profitable in standard competitive markets. Absent this reaction, tying can become profitable. To illustrate this point, consider a monopoly platform A selling a (pay) good A. Suppose there is another competitive market where the platform can sell another product B but there is also a more efficient competitor. Moreover, this product generates advertising revenue proportional to demand and adoption costs prevent multi-homing for the good B. In this setup, if the two goods are proposed to consumers independently, firm A sells good A, while the competitor sells good B and receives the corresponding advertising revenue. Now suppose that the platform ties the good B to good A. Forcing consumers who want to buy good A to also buy good B from firm A reduces the demand of the competitor. This will lead the competitor to reduce its price, but it can only do so to zero as negative prices are not possible. On the other hand, according to the same logic as Amelio and Jullien (2012), firm A is not constrained by this non-negativity condition as it can use good A to subsidize good B (by setting a low price for the bundle) and it is willing to do so because selling good B generates advertising revenue. Therefore, tying may be both profitable due to limited competition for advertising revenue and inefficient as it forces consumers to consume an inferior product B.

While the previous analysis was conducted for bundling goods that are independent but in demand from the same individuals, Choi (2010) and Choi, Jullien and Lefouili (2017), focused on an exclusionary motive for tying a two-sided service to a product M that is essential to the service, the example being tying a media-player to the operating system. When product M is essential to access the two-sided service, a well-known argument from the Chicago School is that a monopoly seller of M (say firm A) has no incentive to exclude rivals in the complementary segment because it can reap all monopoly profit
through the price of product M. Choi (2010) shows that this logic does not apply if the complementary segment is two-sided and only one side buys product M. The intuition is that the monopoly cannot use the product M to capture the value created on the side not buying M. In Choi’s model, the complementary service is used by content producers to access potential buyers. This two-sided service is proposed by the monopoly and a competing independent platform. Absent tying, some consumers multi-home and others single-home, while some content producers multi-home. Some consumers single-home because they have a weak preference for one platform’s standalone offer (exclusive content) and they can access most content with one platform. Some content producers multi-home because they want to reach all single-homing consumers. Following the incremental pricing principle, the presence of multi-homing consumers reduces the price that can be charged to multi-homing content producers and thus the total profit of the platform. Tying the service with product M is a way to break this logic by forcing all consumers to have firm A’s two-sided service. Knowing that they can access all consumers with firm A’s platform, content producers who used to multi-home start to single-home at platform A. This reduces the volume of content on platform B and thus raises the single-homing consumers’ demand for firm A. As a consequence, firm A can charge a higher price to content providers. Whether firm A’s total profit increases or decreases depends on whether the increased revenue from content is countervailed by the reduction of the value of the essential product M for the marginal consumers (who planned to use the competing platforms). While the paper shows a rationale for exclusionary bundling, it also concludes that absent distributive concerns, bundling is socially desirable when it is profitable, the reason being that it raises the total network externality but gives users access to more content.

De Cornière and Taylor (2019a) point to a rent-extraction motive for tying by a powerful seller of complementary applications when negotiating its participation in a platform. In their view, a monopoly provider of an essential complementary application (say, application A) may bundle its application with another application (say, application B), which competes with similar applications, to improve its bargaining position vis-à-vis a platform and obtain more favorable access conditions. This occurs when depriving the platform of application A would significantly reduce consumers’ participation in this platform and thus the value of all the applications it hosts. When the monopoly bundles applications A and B, all competitors for the slot of application B bid less aggressively because winning against the bundle would lead to low value due to lower demand absent application A.\footnote{Note that the argument implicitly assumes limited space for applications on the platform, and competition to access the platform.} This weakens the
platform’s bargaining position and allows the monopoly to obtain better access conditions. In this argument, bundling does not lead to inefficiency but shifts profit from the platform to the monopoly application seller.

As a summary, the insights of the economic literature on bundling are twofold. On one hand, it points out that bundling may raise efficiency and improve coordination. But on the other hand, it also shows that the practice raises new concerns that are specific to markets with platforms, and thus should be the object of special scrutiny.

e) Vertical integration and vertical foreclosure

Vertical integration is quite common for platforms which tend to provide some complementary services in-house and some others by opening the platform to third parties. A well-known case is Amazon, which offers both its own products for sale along with a platform for third-party sellers. Vertical integration by platforms may have several efficiency motivations. In particular, as in any vertical supply chain, it may raise volumes by eliminating “double marginalization”, which refers to the excessive price charged to final consumers resulting from the platform’s exercise of market power on third parties trading on the platform. Moreover, it may facilitate investment and transfer of knowledge to the integrated branch. In the case of platforms, it has some additional benefits because it leads to better internalization of network externalities. In the case of Amazon, the consumers are guaranteed a minimal and reliable supply of good-quality products, even if no third-party seller is active. And the marketplace raises the value of the platform by increasing diversity and the number of products.

Moreover, by integrating some of the supply from side 2 of the market, a platform can credibly convince side-1 consumers that they will be able to trade on the platform. This may help platforms to overcome the “chicken & egg” problem when platforms face unfavorable consumer beliefs. This issue is discussed in the context of a platform intermediating trade between content suppliers and buyers in the work of Hagiu and Spulber (2013). As we have seen when buyers and sellers are potentially interested but skeptical about the success of a platform, the platform must develop a costly subsidization strategy through divide-and-conquer strategies. Then it may offer some integrated content to appear more attractive and reduce the subsidization cost. When integrated content boosts buyers’ participation but impedes sellers’ profit per buyer, Hagiu and Spulber (2013) show that offering integrated content is profitable whenever the platform subsidizes buyer’s participation and generates profit on the sellers’
side. The reverse holds if the platform subsidizes sellers’ participation, as adding integrated content would raise the direct subsidy required to attract sellers. An intuitive conclusion they derive is that when buyers are single-homing, competition for buyers leads to a larger provision of integrated content.

While vertical integration in complementary services by platforms may improve coordination, it also raises the issue of the foreclosure of competing third-party suppliers of complementary services. To illustrate this, Miao (2009) considers a monopoly seller of a platform good that is vertically integrated in a competitive complementary segment which provides applications allowing some third parties to interact with platform members. If the platform could charge third parties directly for accessing its customers, it would benefit from having a competitive complementary segment as this would maximize the value of its own service on both sides of the market. However, if the sole sources of revenue are the revenues from the sales of the platform good and the sales of the complementary application, the platform may have an incentive to monopolize the complementary segment by making its good incompatible with other suppliers of the application. The reason is that competition on the complementary segment dissipates profit to the benefit of the third parties. Incompatibility of the platform good with non-integrated complementary applications then allows the platform to monopolize the complementary segment and extract some monopoly rent from third parties. Of course, this argument holds only to the extent that the platform has no other less inefficient way to exercise its market power (such as charging a price for compatibility, for instance).

De Cornière and Taylor (2014) provide a similar argument in the case of a search engine, based on the issue of appropriation of advertising revenue. They consider a search engine that guides the choice of consumers between several content publishers. Both the search engine and the publishers are solely financed by advertising. In this context, the best choice of publisher for the consumer depends on the match quality of content and the nuisance from advertising that consumers will have to bear. When the search engine vertically integrates with a publisher, it tends to bias the search result in favor of its subsidiary. The reason is that the search engine cannot capture the other publishers’ revenue as there is no listing fee (results are organic) while the search engine benefits from its subsidiary’s advertising revenue. However, they show that there are two countervailing effects. First, as the total advertising revenue per consumer includes advertising revenue from both the search engine and the subsidiary publisher, the integrated firm has more incentive to boost total demand by providing high-quality advice for consumers. Second, the subsidiary internalizes the fact that better perceived quality of content benefits the search engine and thus has more incentive to boost value for users, in particular by
reducing the volume of advertising. Consequently, the effect of vertical integration on total welfare is ambiguous.

Due to the nature of their activity, platforms have many opportunities and ways to foreclose. The issue is therefore worthy of scrutiny by anti-trust authorities. It is particularly acute when foreclosure shifts third-party revenues which cannot be appropriated otherwise – such as advertising revenue or innovation rents – toward the platform affiliate. However, the main question regarding vertical foreclosure by a powerful vertically integrated firm is not so much whether it has the ability to do so, but whether it has the incentives to do so. Here, the platform faces a trade-off between maximizing its long-run value, which requires a consumer-value orientation aimed at improving consumers’ loyalty and generating short-run profits through its subsidiary.

f) Collusion

Despite the existence of several cases of collusion between two-sided platforms, in particular in the media industry, there is little work on collusion between platforms. Tacit collusive behavior occurs when firms coordinate on supra-competitive prices under the common understanding that undercutting rivals’ prices for short-run profit would trigger a breakdown of collusion and competitive prices in the future. In the case of platforms, collusion may occur on all prices but sometime only on prices on one side. For instance, many cases of collusion between newspapers have involved collusion on cover prices only. In this case, platforms coordinate their prices on one side but continue to compete on the other side. Thus, understanding collusion requires examining both possibilities. The key question is to know how platforms achieve collusion in the two cases and with what implications for consumers on the two sides.

From the analysis of competitive and monopoly pricing, we know that a monopoly would not always set prices that are higher than competitive prices on both sides of the market. Competition may exacerbate price skewness in favor of agents generating large externalities. Thus, it is conceivable that colluding platforms would reduce prices on one side, in which case collusion would benefit users of this side. An extensive treatment of this question for consumers in the Armstrong model is Lefouili and Pinho (2018). Let us first consider the case where firms collude on all prices. When all consumers single-home, Lefouili and Pinho (2018) show that the highest sustainable collusive profit is achieved with supra-competitive prices on both sides of the market. Thus, all consumers are hurt by collusion. Things are more complex when either some consumers multi-home or collusion occurs on only one side.
To see that, suppose first that users multi-home on one side and single-home on the other side, in the case of a competitive bottleneck. One may think of sellers being active on several platforms while buyers focus only on one, or advertisers buying space in several newspapers while readers buy only one newspaper. Recall that in this case, platforms compete to attract the single-homing side (the sellers) and charge the other side to access them. As the populations of buyers are different on both platforms, each can charge a “monopoly” price for access to its consumers. Hence, absent collusion, multi-homers already face monopoly prices. As a consequence, collusion has no direct effect on this side. By contrast, prices on the single-homing side (prices for buyers or cover prices of newspapers) are competitive so that collusion would result in higher prices.

Now suppose that all users single-home but collusion only occurs on one side, while the price on the other side is set competitively.\textsuperscript{13} Lefouli and Pinho (2018) show that, provided that network externalities are positive, collusion on one side leads prices to move in the opposite direction compared with competitive prices. There is thus a subtle relation between prices that reflects the dual nature of consumers on platforms: the consumer is paying for the good but also a source of revenue (an input) on the other side of the market. If the firms set the collusive price above the competitive level, then the margin for new sales generated on this side increases and this intensifies competition on the other (non-collusive) side, because attracting these consumers is a way to raise demand on the colluding side. Anticipating that, colluding firms may decide to reduce the collusive price below the competitive level in order to relax competition on the competitive side of the market. This occurs when the externality perceived by agents of the collusive side is large. By contrast, if agents on the collusive side perceive a negative externality (say, readers suffering from advertising nuisance), then all prices increase when collusion emerges.

To summarize, while the general presumption is that collusion would lead to higher prices and lower consumer surplus on both sides of the market, there may be situations where consumers on one side benefit from lower prices when firms collude. In particular, some consumers may gain when collusion only occurs on one side, whether it is on their side or the opposite.

\textsuperscript{13} For instance, the prices may be set by different agents on both sides, only some colluding. Agents setting cover prices of newspapers collude but those setting advertising rates maximize the short-run firm profit.
g) Mergers

Chandra and Collard Wexler (2009) were the first to point that a merger between two-sided platforms need not lead to high prices. Their argument relies, however, on specific correlations between the externalities generated and the standalone valuations. That a merger may lead to lower prices on one side of the market when externalities are large is confirmed by Leonello (2010) and Cosnita-Langlais et al. (2016). Indeed, when the externality generated on the other side is large, it may be more profitable to raise the value on this other side by boosting participation with lower prices, rather than trying to extract more profit by raising prices.

The effect of mergers is further investigated by Correia-da-Silva et al. (2019) who based their analysis on a Cournot model of platforms. It is assumed that each platform sets a quantitative objective, in terms of the number of users it plans to have on each side. Prices on all platforms then adjust and consumers allocate across platforms until all platforms have met their quantitative objective. The Cournot model with homogenous platforms (i.e. platforms that every consumer would find equally attractive for equal network externality) implies that prices adjust to the level of the externality proposed by each platform, so that consumers are indifferent. A merger tends to raise margins, but it also increases the network effects by concentrating agents on fewer platforms. Correia-da-Silva et al. (2019) derive conditions for a merger to raise or reduce consumer surplus. When margins are large relative to network externalities, all prices increase and consumer surplus declines on both sides. But when all margins are small and network effects are large, all users benefit from larger network externalities.

The literature related to the impact of mergers in two-sided media markets is reviewed in Foros et al. (2015). In their seminal work on the two-sided approach to media markets, Anderson and Coates (2005) point to the disciplinary role of competition for consumers on the volume of advertising chosen by a media outlet. By relaxing competition, a merger results in more advertising and lower consumer surplus. However, this result is specific to the competitive bottleneck set-up and is reversed if most consumers multi-home (see Anderson et al., 2019). In this case, there is little competition for consumers and the traditional effect of a merger prevails on the advertising side: increased market power leads to high advertising prices and lower volume.

An interesting feature that emerges with mergers of platforms is the possibility of a “see-saw” effect, namely that consumers on one side benefit from the merger while those on the other side are harmed.
Correia-da-Silva et al. (2019) find a see-saw effect for an intermediate range of network-effects values. In this case, they demonstrate that consumers on the highest cost side (low margin) benefit from increased network externalities while consumers on the other side are harmed due to increased prices. Anderson and Peitz (2017) also exhibit a see-saw effect in their model of media competition, where consumer surplus and advertiser surplus move in opposite directions.

One main difficulty of merger analysis is that, unlike in standard merger analysis, competing platforms may have different business models: some may charge all sides while others charge only one side; some may rely on subscription while others rely on transaction fees. Moreover, platforms offer different bundles of goods and services. Standard models for merger analysis then struggle to cope with such diversity. At the theoretical level, an interesting alternative to standard price-competition models explored by De Cornière and Taylor (2019b) is to rely on so-called “utility competition” (Armstrong and Vickers, 2001). In this approach, firms do not compete solely on prices but rather on net value proposition, where the net value is a utility index of quality and price. To understand this approach, suppose that the demand on one side depends on quality Q and price P. Then we can build an index U=Q-P and postulate that demand depends only on this index. Firms will thus compete by offering different levels of U. The firm’s revenue then depends on both Q and P and its cost depends on Q. De Cornière and Taylor (2019b) show that this approach is quite flexible and can accommodate many features that matter for platform competition. It can accommodate different business models in the same industry as well as different ways to provide quality and generate revenue. For instance, one firm could choose to offer a zero price but lower quality by monetizing through advertising, while another could choose a pay service with no advertising. These firms will differ in revenue, cost and value proposal, but ultimately demand can be derived by comparing the induced U-indexes. As another illustration, the quality Q can be derived from very different bundles of services offered by different firms.

De Cornière and Taylor (2019b) then illustrate this approach by analysis of a situation in which a platform collects unique data on its users and sells this data to duopoly firms competing on other markets. In this case, data is an input in the process of delivering utility to consumers in the downstream market. Being the exclusive beneficiary of the data gives an advantage to the firm. Depending on its impact on utility competition, the outcome may be the exclusive or non-exclusive sale of data. They investigate the effect of a vertical merger between the upstream platform and one client.
According to a standard Chicago School argument, because the upstream platform has a monopoly on its data before and after the merger, the integration does not affect the allocation of data across the two downstream firms. But it affects the distribution of profit and the incentives of the upstream platform to invest in data collection. When data makes a downstream firm more competitive, De Cornière and Taylor (2019b) show that the vertically integrated firm has lower incentives to invest in data collection because it wants to limit the intensity of competition. As a result, it may also reduce its investment in quality of service. All consumers obtain lower utility after the merger, those of the upstream firm because of lower quality and those of the downstream duopoly because of lower intensity of competition. The conclusions are reversed, however, if data is not traded on the market or if it weakens competition downstream.

The literature on mergers of platform is still in its infancy, due to the difficulty of modeling multi-platform competition. But some lessons already emerge. First, a general presumption that prices increase on all sides following a merger does not hold for platforms. Consequently, it will be necessary to identify precisely when such a presumption exists and for other cases, what is the likely effect on prices. Obviously, for small network externalities, this presumption should hold. Second, when some agents single-home on both sides, any merger involves some immediate efficiency gains due to larger network externalities in more concentrated markets. Hence, a merger evaluation needs to focus on prices adjusted for externalities rather than just prices. It can be the case that prices increase but consumer surplus increases due to larger network externalities. Third, as the merger affects different populations on each side, there may be conflicting interests between very different groups of users (readers and advertisers, buyers and sellers, etc.). Balancing the interests of the various sides may be a difficult exercise and may require moving back in the value chain outside the platform (for instance, advertisers are themselves intermediaries and, ultimately, we should care about producers and consumers using their services).

VI. Conclusion

This report was motivated both by the debate related to the growing role of platforms in the economy and by the need to take stock of 15 years of research in economics on this issue of platform competition.

14 A similar conclusion is reached by d’Annunzio (2017) for investment in the premium content by a content producer selling to TV channels.
As discussed in this report, the particularity of platforms – and therefore of competition between these platforms – comes mostly from the importance of network effects. Network effects exist in other industries, especially when infrastructure investments are important, but in the case of platforms, they are mainly demand-driven. In other industries characterized by the effects of demand-driven networks, users are quite homogenous in their expectations whereas modern platforms are innovative intermediaries connecting heterogeneous users (consumers / firms, readers / advertisers, ...). This creates scope for price discrimination and complex pricing strategies.

The question of the efficiency of the competitive process but also of the value of public intervention is therefore structured by the importance of these network effects.

When network effects are large, it is globally efficient to have users joining on the same platform. This concentration maximizes gains at the level of society as a whole but market power stands in the way of platform users when it comes to recovering some of these gains. So we have both strong value creation and high inequality in the sharing of this surplus.

When network effects are more limited, differences in service or quality offered by different platforms allow the coexistence of actual competition between platforms. But this competition can lead to overly imbalanced price strategies between the various sides of the market, because of the incentives to steal the competitor’s business.

What can we say about public intervention in this context?

Even though two-sided markets have specific characteristics, traditional anti-trust issues persist. The definition of markets or the measure of competition need to be analyzed differently in a two-sided market compared to a standard market. But once the necessary adaptations have been made – and the scientific literature has greatly progressed in this area – it seems quite possible to think about competition policy in the case of platforms with the same philosophy as in standard markets.

In particular, when activities involve relatively small network effects, standard anti-trust analysis can be adapted to account for the specificity of platforms and new theories of harm. However, the difficulty remains that perfect competition does not provide a proper benchmark for efficiency.
In the case where the effects of networks are very large, and therefore where a firm tends to dominate, the question is more intricate. On this front, the ability of consumers to multi-home is quite important. Even if this behavior decreases a little the gains of entry for a new platform, multi-homing facilitates entry and thus preserves the competitive dynamics without sacrificing too much efficiency.

A difficulty with tipping in platform markets is that a dominant position may be acquired and preserved on merit. Preserving dynamic competition for the market may require some pro-active intervention. In this regard, we should point out that tipping in digital markets may not resemble a natural monopoly as encountered in infrastructure markets. Large heterogeneity and low entry cost imply that while there may not be room for two large platforms, there are usually niche opportunities for small platforms, which may have the potential to challenge the incumbent. One of the risks associated with a lenient competition policy is that the dominant firm may stifle or buy all the small platforms likely to replace it as the dominant platform. It is important that the sector, even if characterized by significant network effects, allows innovation and the diffusion of innovation. Anti-trust authorities may have a role to play, by making sure that small but innovative platforms can stay alive and access their public.
BIBLIOGRAPHY


[41]. Evans, D.S. (2017). “Why the dynamics of competition for online platforms leads to sleepless nights but not sleepy monopolies”, mimeo.


