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Innovation, Competition and Digital Platform Paradoxes

Policy Papers on Technology, Economics
and Structural Change 2021.1

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EXECUTIVE SUMMARY

There is a growing debate about how digital platform companies, or ‘big tech’, influence innovation and competition in the European digital economy. Are they helping or hampering competitiveness? In this debate, a lot of arguments draw on research and policy rationales that do not take the particularities of multisided platform economies fully into account. This paper approaches the subject by focusing on the characteristics that set digital platforms apart and how the value of information coordination has changed in the wake of digitalisation. Against this backdrop, five platform paradoxes are introduced – policy issues that contain unarticulated trade-offs or contradictory implications concerning innovation and competition. This is not an exhaustive list of policy issues nor the answers needed to settle them. The purpose is instead to provide a basis for formulating better questions that can serve as input to an ongoing informed policy debate.

A digital single market is a long-standing policy priority in the EU. Yet, the European digital economy remains fragmented. Digital platform companies contribute to market convergence and a digital single market by absorbing information coordination costs.

Information coordination and matchmaking are essential to leverage the potential benefits of the pervasive digital technologies. In the wake of digitalisation, one of the core concerns in the economy is shifting from scarcity (finding someone to trade with) to selectivity (picking someone to trade with). In much the same way that cities have played a key role in economic development and growth by bringing people and activities together, multisided digital platforms are now matching people, activities, and markets together.

Multisided platforms are matchmakers. They compete with their ability to lower search and transition costs as well as the quality of their matchmaking. Digital platform companies exhibit several characteristics that differ from other traditional businesses:

- **Multisided platform economies are not new.** Shopping malls, video game consoles and credit cards all rely on multisided platform economies as their business model. However, digitalisation provides a set of new conditions –computational power to handle vast amounts of information, large data-generating networks and software to make it all programmable – that make it possible to establish multisided platforms for new types of economic activities and scale them in unprecedented ways.
- **There is no platform industry.** Platform companies differ significantly across sectors as well as with respect to their function and the way participants engage with them. Consequently, there is no one-size-fits-all answer for how to leverage the benefits of platform economies and accommodate them within existing regulatory frameworks.
- **Digital platform economies generate subsequent changes in their market.** Ride-hailing services like Uber or Bolt not only compete with traditional cab services but also call into question how the industry is organised and regulated. A similar argument applies to Airbnb and hotels, Amazon and bookstores, or for that matter digital healthcare services like Kry or Babylon Health vis-à-vis the traditional healthcare sector.

- **Multisided platform economies enable innovation and entrepreneurship in at least three different ways apart from increasing the competition between sellers:** 1) creating markets for niche products that would not survive on their local markets alone, 2) enabling modular innovation that builds on an existing technical infrastructure (e.g. apps), and 3) matching business problems or societal challenges with external innovation efforts (e.g. open innovation).
- **When platform companies grow, they leverage the feedback of network effects.** Network externalities work both ways. Positive network effects attract additional users to either side of the platform, but in a similar manner negative network effects lead to crowding, noise and unwanted competition that deters users. These different effects must be balanced against each other, something that is especially hard for very small or very large platforms.
- **Many platforms are free, or subsidised, for users on one side.** The reason for the asymmetric pricing is that one side of the platform has a lower demand elasticity and is willing to pay more than the other for being matched. That is, the presence of users on the subsidised side of the platform creates a disproportionately large value for users on the subsidising side.

Five platform paradoxes

The state of competition and innovation in the digitalised economy has become the subject of increased debate among both academic researchers and policymakers. While there is growing criticism against platform companies for their dominant market positions, there is also an emerging rough consensus that the current competition policy toolkit is not apt for gauging and evaluating multisided platform markets. In this paper, five platform paradoxes are introduced – policy issues that suggest unarticulated trade-offs or contradictory implications that need to be addressed in the ongoing debate:

- **Killer shadows or markets for innovation and entrepreneurship?**
The first paradox is that big tech companies appear to both inhibit and stimulate competitive innovation and entrepreneurship. They acquire startups that could have turned into future competitors, but by doing so they also create a market for entrepreneurial and innovative efforts and a potential exit strategy for entrepreneurs and innovators. A possible resolution to this paradox is to treat the combination of acquisitions and competition as a selection mechanism for innovative activities, which favours radical innovations rather than incremental improvements. The main policy issue then boils down to deciding if there is a need to promote a different mix of innovative activities than those currently taking place and, if so, to motivate this need and the means to satisfy it properly.
- **Asymmetric pricing or anti-competitive conduct?**
The second paradox comes from the asymmetric pricing applied by many platforms. It might seem easy to solve by disregarding price-related indicators of anti-competitive conduct, but it is more complicated. A similar argument could be made for concepts like “market definition” and “market shares”. Reducing the scope of competitive evaluation by removing price indicators would not automatically make multisided platforms fit into the traditional competition policy mould. Removing failing indicators calls for the formulation of new ones to replace them. For one thing, antitrust investigations with respect to price indicators could be extended to include all sides of the platform in order to determine if and when the platform business model changes the outcome of the evaluation.

- **The value of data or the value of structure?**

The third paradox is that because data does not gain value from its size, which is cheap to scale, but from its structure, which is associated with a growing cost with size, large or growing firms are the ones with the means and incentives to build large data repositories. If these incentives are removed by regulation, investments aimed at finding new patterns and insights in large data sets risk being toppled.

- **Dominant position through network effects or because of regulatory burden?**

A few large digital platform companies hold dominant positions in their respective markets. However, regulation generates compliance costs which also drive market concentration. Thus, the fourth paradox is that the same market concentration can result either from network effects, or through regulation aimed at removing it. The difference lies in the market's dynamics and ability to change.

- **Competition or innovation?**

The fifth paradox is that trying to promote innovation through competition policy may prove to be inefficient or even counteractive. For innovation to be a priority in antitrust enforcement, there is a need for tangible indicators to evaluate and base a decision upon. However, we know little about where the next radical innovation comes from and any attempt to imagine what it might look like is limited by a frame of reference based on what we already know. Such procedures risk favouring incremental improvements in established markets over radical innovations.

POLICY PAPERS ON TECHNOLOGY, ECONOMICS AND STRUCTURAL CHANGE 2021.1

INNOVATION, COMPETITION AND DIGITAL PLATFORM PARADOXES

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1. BUILDING DIGITAL COMPETITIVENESS: FROM INFORMATION TO INNOVATION

There is a growing debate about how platform companies, or ‘big tech’, influence innovation and competition in the European digital economy. Are they helping or hampering digital competitiveness? In this debate, a lot of the arguments draw on research and policy rationales that do not take the particularities of multisided platform economies into account. This discussion paper is an attempt to approach these issues from a slightly different perspective, focusing on the specific role of platform economies and how the value of information coordination has changed in the wake of digitalisation. The intention is not to close the debate, but to make a small contribution towards improving the questions to which the continued discussion must provide the final answers. The rest of the paper provides an overview of platform economies (part 2) and introduces five platform paradoxes – policy issues that exhibit unarticulated trade-offs or contradictory implications (part 3). Lastly, the paper is concluded with summary remarks (part 4).

At its core, innovation is about how people and organisations process information in new ways. Technological development has always been central to economic growth and prosperity. There have been a variety of theories about how new technologies and, by extension, innovation come about in the economy (e.g. Schumpeter, 1934; Bimber, 1990; Godin, 2008; Coccia, 2018). In the 1980’s, economists developed mathematical models which treat new technologies and innovation as the outcome of combinations of existing ideas within the economy (Verspagen, 2005; Braunerhjelm et al, 2012). New ideas are then turned into inventions that are brought to the market and those that are successful become innovations. This framework, endogenous growth theory, underpins much of the current economic policy toolbox and makes up the *raison d’être* of innovation policy. Accordingly, change is increasingly treated as a natural and inherent part of the economy. Furthermore, it is becoming evident that information – how it is produced, shared, propagated and combined into new ideas – is central to facilitating change.

At first, information was treated by economic scholars as a public good accessible to anyone, but attention soon shifted from disembodied information to human capital, connecting but also restricting information and ideas to individuals and interactions, and later to contexts and local places (Romer, 1986; Lucas, 1988; Krugman, 1991; Rauch, 1993; Jones, 1997; 1999; 2005). While information may be non-rivalrous in theory,

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i.e. any number of people can benefit equally from the same information, it is in fact diffused and absorbed unevenly among people and organisations in the economy. The shift from information as a public good – accessible to anyone anywhere, disembodied and placeless – to information as embedded in places, people and interactions helps explain why cities have come to play a key role in the economy. Cities concentrate people and interactions in ways that lower the threshold for information flows, knowledge spillovers, learning, imitation and innovation in an increasingly knowledge-intensive economy (Glaeser, 1994; Batty, 2013; Bettencourt et al, 2007; Andersson et al, 2019).

With the development of information and communication technologies and the subsequently ongoing digitalisation of the economy, the cost of moving information around the world – or information coordination costs – has decreased significantly. This makes it possible, among other things, to coordinate complex activities from afar (Baldwin, 2016). Digital technology constitutes a new *General Purpose Technology* (GPT), on par with steam power and electricity before it, that has been integrated into the entire economy and implemented for a wide variety of applications (Bresnahan and Trajtenberg, 1995; Varian, 2003; Lipsey et al, 2005; Grajek, 2012; Brynjolfsson and McAfee, 2014; McAfee and Brynjolfsson, 2017). So, does this mean that digitalisation removes the barriers to innovation? The answer is both yes and no.

The combination of increasing computational power at falling costs, growing data-generating networks, and software which makes the technology programmable paves the way for a far-reaching structural change and reorganisation throughout the entire economy (Auerswald, 2017). Barriers to entry for new ventures are lowered as the need for capital investments decreases substantially. For example, small and medium-sized enterprises (SMEs) can leverage computational resources through cloud services and software as a service (SaaS) that would previously have been unattainable due to the sunk costs associated with investing in the necessary capital (Varian, 2018). In fact, a growing variety of business functions are becoming available on as-a-service-basis.² Ubiquitous connectivity and large digital networks also give rise to new forms of collaboration and business models, including the rising sharing and gig economies (Benkler, 2006; Benkler, 2017; Sundararajan, 2017; Bergh et al, 2021). At the same time, intangible assets and investments are becoming increasingly important to startups as well as established firms across industries. In addition, patents are becoming increasingly software-dependent across industries (Haskel and Westlake, 2018; Crouzet and Eberly, 2018; Branstetter et al, 2019; Andersson et al, 2021). There are, however, other and new barriers to innovation.

While the internet makes unprecedented amounts of information available and makes it next to free for anyone to communicate across the globe with a proper connection, it does not change the fact that people and organisations receive and absorb information unevenly. As the amount of information grows, it is obvious that our time and attention are becoming bottlenecks. As Nobel laureate Herbert Simon notes in his essay on an information-rich world (Simon, 1969):

“Now when we speak of an information-rich world, we may expect [...] that the wealth of information means the death of something else – a scarcity of whatever information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among an overabundance of information sources that might consume it.”

If innovation is the recombination of existing information into new ideas that can be brought to the market, a wealth of information is no guarantee for generating more innovation. On the contrary, with a growing

2. AaaS, or Anything as a Service, e.g. https://en.wikipedia.org/wiki/As_a_service

amount of information comes an increase in non-relevant information, or noise, for every thinkable undertaking. The cost of collecting, validating, structuring, and interpreting information grows fast. Thus, much like cities improved the flow of information between people by bringing them together, digital platforms improve the flow of information by curating it, matching supply with demand. While cities help people overcome a scarcity of information distributed in the physical economic geography, platforms using data-driven services and algorithms help people navigate an abundance of information in the digital economic geography. In other words, we would not be able to leverage the benefits of digitalisation, that we have come to take for granted, if not for digital platform economies and algorithms (Evans and Schmalensee, 2016; Tirole, 2017; Wernberg, 2018).

In a European context, a digital single market has long been a high policy priority. Yet, the European digital economy is fragmented into an archipelago of regulatory frameworks and heterogeneous interpretations of European directives. There are still considerable technological gaps and regulatory heterogeneity between countries. According to the *Digital Economy and Society Index* between 2015-2020, the gap between leaders and laggards have grown in three out of five categories of indicators (connectivity, human capital, and integration of digital technologies). There is also considerable fragmentation in the innovation systems and innovation policy frameworks between EU member countries (Mohnen et al, 2018).

According to a study from the World Bank, EU countries are exhibiting faster convergence in access to digital technologies than in outcomes from using said technologies. Technological advances are most pronounced in operational technologies that tend to be concentrated to larger firms and existing functions (Hallward-Diremeier et al, 2020). The authors of the study argue that transactional technologies, like digital platforms, hold the highest potential for connecting markets and promoting market inclusion, but also conclude that the EU is falling behind in developing such technologies of its own. One important explanation is the fragmentation of the European digital market which makes it harder to grow and scale new platform economies. Yet, even if many of the currently leading platforms are not European by origin, they still contribute to market convergence and a European digital single market by absorbing information coordination costs. Apart from promoting the growth of European platform companies, the EU stand to gain much from making it easier for individuals and firms to leverage the benefits of existing platform economies.

Innovation and competitiveness depend on information coordination and its related costs. The next chapter provides an overview of the role that multisided platform economies play in solving such coordination problems.

2. MULTISIDED PLATFORM ECONOMIES

2.1 Matchmakers

Historically, information was a scarce resource and one of the main economic problems was finding and reaching trading partners. In this economic geography, cities provided a vital platform economy for bringing economic activities together. Now information is abundant, and the problem is to identify the right trading partner to engage with among millions. In this digital geography, platforms provide an equally vital infrastructure that puts them at the heart of economic activities and makes them crucial to digital competitiveness: they are *matchmakers* (Evans and Schmalensee, 2016; Bhaskar, 2016; Tirole, 2017; McAfee and Brynjolfsson, 2017; Wernberg, 2018).

Multisided platform economies are not new, nor are they a uniquely digital phenomenon. Shopping malls, video game consoles and credit cards all rely on multisided platform economies as their business model. However, digitalisation provides a set of new conditions – computational power to handle vast amounts of information, large data-generating networks with instant access and software to make it all programmable – that make it possible to establish multisided platforms for new types of economic activities and scale them in unprecedented ways (Evans and Schmalensee, 2016; Wernberg, 2018). As reported by Tirole (2017), the world’s five largest companies are multisided platforms and so are seven out of the ten largest startups.³ While most of the well-known platform companies cater to end users on at least one side of the platform, there are also examples of strictly business-to-business platforms that match firms together (Evans and Schmalensee, 2016)

Multisided platform economies supply matching as a service between two or more groups. Platform companies compete for users with the quality of the matches they provide, which in turn depends not only on the number of users but also on the interface and mechanisms necessary to enable interactions and transactions between users. This includes, for example, a variety of recommendation algorithms to provide curated content and contacts, rating systems to capture cumulative reputations and insurance solutions to cover relevant liabilities.

2.2 Platform heterogeneity

While there are similarities and common denominators between platforms, there is no “platform industry”. Apart from variations across industries, platforms also differ with respect to function. Platforms can be *market makers* that enable transactions between distinct groups, *audience makers* that match advertisers with an audience, and *demand coordinators* (or technological platforms) that do not engage in active matchmaking but create value for participants by providing as large supply on either side as possible (Evans, 2003). Amazon and shopping malls are both examples of market makers, while Google’s search engine and most newspapers are audience makers, and gaming consoles or operating systems are demand coordinators. There are also what is best described as meta platforms, that attempt to match users with competing platforms. For instance, the app Myntra allows drivers to pool assignments from the ride-hailing platforms Uber and Lyft. The company Appjobs similarly allows gig workers to pool assignments from a wide range of gig economy platforms.

It is also worth pointing out that some platform companies may transition out of being multisided platforms over time. If a platform company starts acting as supplier on one of the sides in the platform, it conforms to what Tirole (2017) describes as the standard model of the firm which only attracts final customers. For example, Apple started building its own computers in the 1980’s, Amazon supplies its own products in competition with other sellers on its platform, and Uber has attempted to develop self-driving cars which could ultimately replace its drivers. It is not unrealistic to think that some of today’s platform companies are using their platforms as a transitional phase in their long-term business development.

Furthermore, how and for what purpose platform services are utilised may differ among participant groups. For example, the emerging gig economy consists both of manual assignments without specific skill requirements and knowledge-intensive assignments. In this case, the former may provide a potential entry into the labour market while the latter pools assignments and expands the market for professional freelancers. These two groups utilise the same type of platform service but in different ways and with different effects for the labour market as a whole.

3. As of August 2020, four out of the five largest publicly traded firms, measured by market capitalisation, are still multisided platforms (Apple, Microsoft, Alphabet and Amazon)

These heterogeneities among platforms and the way they are utilised speak against the idea of regulating platforms collectively. There is simply no one-size-fits-all answer for how to leverage the benefits of platform economies and accommodate them within existing regulatory frameworks. Instead, policymakers need to apply a case-by-case approach guided by rigorous economic analysis of platform economies across different industries (Tirole, 2017).

2.3 Changing the organisation of economic activities

A growing number of digital platforms, especially those associated with the sharing and gig economy, contribute to formalising and scaling up activities that used to be part of the informal economy or limited to smaller communities where everybody knows everybody (Evans and Schmalensee, 2016; Sundararajan, 2017; Bergh et al, 2021). While this contributes to new entrepreneurial opportunities, it requires more than merely matching. There is a considerable difference between accepting a ride from your neighbour or leasing your summer house to your childhood friend and conducting those same transactions with a stranger. Thus, one of the biggest hurdles for platform economies, and therefore also one of their greatest achievements, is to establish and grow a trust infrastructure between strangers being matched together, as well as between the participants and the platform company (Mazella et al, 2016; Tirole, 2017).

Non-platform businesses may simultaneously compete with and benefit from multi-sided platforms (Wernberg, 2018). Digital platforms contribute to falling prices by bringing suppliers into more efficient competition with each other on one side. At the same time, suppliers are matched with unprecedented numbers of potential consumers on the other side, thus potentially making it worthwhile to participate despite increased competition. The increased variety of products in turn contributes to a significant consumer surplus (Brynjolfsson et al, 2003). For niche products, like rare second-hand books, improved matchmaking through digital platforms may actually result in increasing prices because sellers are able to match with buyers who value the product's rarity (Ellison and Ellison, 2018). Even when firms compete with one side of the platform's business, they may still benefit from participating on its other side. Following a number of court rulings in the late 2000's, Google closed its news aggregating service Google News in Belgium, Germany and Spain because newspapers had complained that the service benefitted from their news content without compensating them for it. As a result, web traffic to these newspapers dropped significantly, and each of the newspapers reportedly asked to have the court's ruling revoked to regain their traffic (McAfee and Brynjolfsson, 2017, p. 139-140). Thus, platforms may compete with parts of an incumbent firm's business model without being in head-on competition with the firm's business, thereby creating a pressure for change that goes beyond competition.

The introduction of digital platform economies will, depending on the industry, give rise to subsequent changes in the market. Nobel laureate Ronald Coase (1947) argued that firms are organised by internalising activities that are more costly to perform as transactions in the open market. By that logic, as the conditions for economic activities change, so will the nature of the firms in that market. Platforms that offer quality information and matching contribute to lowering transaction costs associated with search, bargaining and decision, and enforcement of contracts (Lobel, 2018). Ride-hailing services like Uber or Bolt not only compete with traditional cab services but also call into question how the industry is organised and regulated. A similar argument applies to Airbnb and hotels, Amazon and bookstores, or digital healthcare services like Kry and Babylon Health vis-à-vis the traditional healthcare sector. The growing number of digital platforms in regulated industries like healthcare hold great promise for future prosperity as well as for digital competitiveness, but it also increases the need to deal with

one of the main obstacles for new platform companies in the European digital market: The regulatory heterogeneity that makes it hard to scale new digital business models across different EU countries (Veugelers et al, 2012).

2.4 Innovation and entrepreneurship on platforms

Multisided platform economies generate opportunities for innovation and entrepreneurship in at least three different ways apart from increasing the competition between sellers. First, improved matching of supply and demand on an international market lowers trade costs and improves conditions for exporting, especially for SMEs (Andersson, 2000; Lendle et al, 2012; Lendle, 2013). This lowers the barriers for cross-border trade, but also enables entrepreneurs to potentially reach a large enough consumer base to establish and maintain a business for niche products and services that were not sustainable on a smaller market (Lundblad and Andersson, 2015).

Second, some platforms provide a scope for *modular innovation* that builds on the existing infrastructure. Apple's Appstore, Microsoft Windows or Google maps and Tensorflow all enable innovators to build on top of an existing platform architecture and draw on existing (and growing) data sets in different ways (Evans et al, 2008). Modularity lowers the barriers to innovate while also creating value that helps the platform to improve and attract more users. This requires some degree of openness, allowing others to develop applications and products for the platform.

Third, platform economies can be used to match business problems or societal challenges with innovative solutions. For example, Innocentive and Kaggle both provide for profit marketplaces for *innovation prizes* and *crowdsourcing* (Kay, 2011; Brunt et al, 2012; Saez-Rodriguez et al, 2016). This allows both small and large firms to draw on external resources for their innovative activities, something that is becoming increasingly important to maintain competitiveness in the face of technological development and radical change (Pavitt, 2005). Innovation prizes also offer a solution to asymmetrical information problems that arise between established organisations and external innovators working with new technologies. People within the organisation know what problem they need to solve but lack knowledge about the new technologies needed to facilitate internal innovation activities, while potential innovators with the necessary technical skills outside of the organisation lack the domain knowledge required to understand the problem properly (Wernberg, 2021).

2.5 Network effects, size and competition

When platform companies grow, they leverage the positive feedback of *network effects* or *network externalities*. By attracting users, the platform becomes more attractive to additional users. For example, a social networking platform becomes more useful the more friends it puts you in contact with, the benefits of a dating app grow with the number of potential partners you can find, and advertisers will – on balance – choose channels that expose their adverts to as many potential customers as possible. This contributes to a winner-takes-all or winner-takes-most dynamic where some platforms become very large, resulting in a power-law distribution among firms in the market. This concentration is not abnormal in markets with network effects and economies of scale, but it is not necessarily stationary either (Tirole, 2017).

Because many, if not most, of the large high-tech firms are multisided platforms, there are growing concerns that network effects are contributing to anti-competitive monopoly markets. This, however, does not take into account that network externalities work both ways. When social networks include too many

people, the flow of information becomes crowded, when the number of users competing for the same potential partners on a dating app grows too large it loses value to the individual suiter, and when there are too many ads competing for your attention both advertisers and users lose interest. There are positive and negative network effects that are either direct or indirect (Evans and Schmalensee, 2016). Direct effects relate to the gain or competition between users on one side of the platform, whereas indirect effects relate to the benefits or losses incurred on one side due to changes in the other side of the platform. These different network effects must be balanced against each other, something that is especially hard for very small or very large platforms.

Growing a platform differs from starting a regular one-sided business because the platform must attract two groups of customers so that the demand on one side provides the supply for the other side – reaching a critical mass on both sides is essentially a chicken and egg problem (Rochet and Tirole, 2003; Evans and Schmalensee, 2010; Tirole, 2017). Many platforms initially aim to attract a small niche of their market to obtain the necessary network effects and then expand their matching offer (Vinberg and Henrikson, 2017). Just as it is hard to ignite a new platform economy, it also becomes increasingly hard to maintain balance between conflicting network effects as the platform grows. With respect to the quality of information and matching, large platforms are subject to negative direct and indirect network effects that create noise and crowding. Thus, recommendation algorithms, curated news feeds, and the formation of smaller groups within the platform are not just aimed at increasing but also maintaining the quality of platform services under growing information congestion.

Following this line of argument, we should expect the competition with large platforms to come not necessarily head-on from substituting platforms but from a variety of complementary niche platforms that provide higher matching quality in their respective niches. The possibility of niche competition is furthered by the fact that many platforms are free for users on one side, or rather subsidised by users on another side. This lowers the barriers for multihoming on the subsidised side, i.e. being on many platforms simultaneously and simply redirecting attention to the ones that provide the best matching quality for different ends (Evans and Schmalensee, 2016; Wernberg, 2018). The reason for the asymmetric pricing is that one side of the platform has a lower demand elasticity and is willing to pay more than the other for being matched (Tirole, 2017). Put differently, the presence of users on the subsidised side of the platform creates a disproportionately larger value for users on the subsidising side. For example, advertisers value the access to Facebook users more than the users value the ads they receive in their Facebook newsfeed.

Network effects do not guarantee success and size offers no complete escape from competition. Rather, high market concentration and competition can coincide for platform markets. Before Google, people used Altavista to search the web and people connected on Craigslist to rent or lease spare rooms long before Airbnb came along. New matchmakers have been replacing and complementing existing matchmakers with increasingly better matching quality for a long time. Consider for example the competition and consequent rebalancing that is taking place between downtown city centres, shopping malls and the growing e-commerce platforms. These are three different types of multisided platforms that provide partly substitutionary services for shoppers. Neither would appear to fully substitute the others, but each has to find its own comparative advantage in this new mix of shopping behaviors. Yet, the existence of a few, very large platform companies contribute to what Evans and Schmalensee (2016, p. 202) call an “end-of-history illusion”. These firms are certainly larger than their predecessors, but so are the markets they are operating on.

3. COMPETITION AND COMPETITIVENESS: FIVE PLATFORM PARADOXES

The state of competition and innovation in the digitalised economy has become the subject of increased debate among both academic researchers and policymakers. While there is growing criticism against platform companies for their dominant market positions, there is also an emerging rough consensus that the current competition policy toolkit is not apt for gauging and evaluating multisided platform markets.

It should be pointed out that competition is no end in and of itself (Tirole, 2017). It is the means to an end, and to determine what sound competition looks like, the intended end must be put in relation to the measures used to reach it. Competition policy typically builds on three types of analytical input (price collusion, abuse of dominant market position, and acquisitions or mergers) which are measured and evaluated with respect to mainly two types of outputs or policy goals (consumer welfare and innovation). This policy toolkit does not apply to multisided platform economies in the same way as it does to other types of business models, and the perhaps largest problem is that it is not evident how large the mismatch actually is. Subsidised pricing on one side of a platform is not evidence of anticompetitive pricing. Skewed market distributions are not necessarily unfavourable to firms or individuals using platform services – in many cases, quite the contrary. Acquisitions of innovative startups may affect future competition but they also create a market for entrepreneurial and innovative efforts as well as a potential exit strategy for entrepreneurs and innovators. Turning to the intended output of competition, it is proving equally difficult to determine the effects on consumer welfare beyond price levels (which in many cases are low or zero) or to ground policy decisions on forecasts of potential innovation for digital platforms across industries.

Against this backdrop, there is a need to identify and deal with what is not working in order to advance the discussion and contribute to policy formulation. Digital platforms are not beyond the scope of regulation by virtue of being different. However, applying traditional antitrust tools to digital platform companies is unlikely to yield a sound policy response to the ongoing structural change. To this end, this section introduces five platform paradoxes – policy issues that contain unarticulated trade-offs or contradictory implications. This is not an exhaustive list of policy issues nor the answers needed to settle them. The purpose is instead to provide a basis for formulating better questions that further the ongoing policy debate. Digital platforms make up a central cog in this new economy. Understanding the dynamics of competition between platforms and the role they play for overall competition within the economy is crucial to foster long-term competitiveness in the European digital economy.

3.1 Killer shadows or markets for innovation and entrepreneurship?

One of the main concerns for competition in the digital economy is that large high-tech firms are either buying up or excluding their would-be competitors from the market. There are several arguments to this point (Gilbert, 2020). One is that there is a “kill zone” surrounding the big tech companies consisting of potential innovations which venture capitalists do not want to finance out of fear of being swiftly outcompeted. Another argument to this point is that large firms have the resources to imitate potential rivals and, due to their attained network effects, outcompete them. A third argument is that big tech companies are becoming increasingly proficient at identifying potential competitors and acquiring them before they grow too large. In fact, large firms are creating important markets for entrepreneurial and innovative activities because the opportunity to sell a startup or innovation is a powerful incentive to innovate in the first place (Braunerhjelm et al, 2012; Norbäck and Persson, 2012; Gilbert, 2020).

The first paradox is that big tech companies appear to both inhibit and stimulate competitive innovation and entrepreneurship. The notion that large firms can imitate rivals and thus outcompete them certainly holds for incremental innovation, but less so for radical innovation which cannot easily be incorporated into their existing business (Henderson, 1993). A possible solution to this paradox is that all three mechanisms – venture capital, imitation and acquisitions – contribute to a selection of innovative activities that in this case favours radical innovations rather than incremental improvements.

The question is if this is necessarily a bad thing, considering that the alternative would seem to be to promote, through regulation, the growth of many similar platform services which would inhibit network effects to the disadvantage of users on all sides of the platform. Because platforms sell matchmaking, larger market concentration typically enables higher competition among the actors being matched, benefitting consumer welfare. While the opening of another hardware store in a small town may create competition that leads to lower prices on nails, the (successful) introduction of several substitutable platform services in a market creates market fragmentation and introduces coordination problems that are likely to affect consumer welfare negatively. This suggests a need to differentiate between competition among substitutable and complementary platform services, or between incremental and radical innovation among new competitors. The main policy issue then boils down to deciding if there is a need to promote a different type or mix of innovative activities than those currently taking place and, if so, to motivate this need and the means to satisfy it properly.

3.2 Asymmetric pricing or anti-competitive conduct?

Asymmetric pricing is common on multi-sided platforms, but it gives the impression of anti-competitive conduct when each side is viewed mechanically from a classical competition policy point of view (Tirole, 2017; Gilbert, 2020). On the one hand, the subsidised side often offers users free access, which on its own appears to be predatory pricing aimed at pushing out competition from the market. On the other hand, the subsidising side of the platform would appear to be conducting overpricing which indicates monopoly rents.

The second paradox may at first glance appear easy to resolve by disregarding price-related indicators of anti-competitive conduct, but it is significantly more complicated. A similar argument could be made for concepts like “market definition” and “market shares” (Gilbert, 2020). What market(s) are Google, Facebook or Amazon operating on? And should the market share of Facebook be based on number of registered users, daily active users, or number of clicks on advertisements? Reducing the scope of competitive evaluation by, for example, removing price indicators would not automatically make multi-sided platforms fit into the traditional competition policy mould. Removing failing indicators requires the formulation of new ones to replace them. There is a short-term need for case-by-case assessments in combination with rigorous economic analysis to treat current cases and a longer-term need for new tools and a reconceptualisation of competitive dynamics (Tirole, 2017). For one thing, antitrust investigations with respect to price indicators could be extended to include all sides of the platform in order to determine if and when the platform business model changes the outcome of the evaluation.

On a related note, it is not uncommon for digital platforms to require participating firms to offer the same price for their products or services across different sales channels. If the platform charges a fee for matching firms with customers, the cost of the fee will likely be distributed across all the firm’s customers, even those that are not using the platform. In other words, the platform fee would marginally increase prices for non-platform users and thus result in a decrease in customer welfare. On the other hand, such

regulation prevents price discrimination between customers based on their savviness to compare prices, pushing for overall price reductions through market convergence and higher competition across sales channels. The question is whether the cost of the fee is acceptable in proportion to the price reduction that follows with increased competition in the market in question.

3.3 The value of data or the value of structure?

Data has repeatedly been described as the new oil of the information economy (The Economist, 2017). There are growing concerns that big tech firms have gained an unsurmountable competitive advantage through their large data repositories. Some have even argued that with large enough amounts of data, it might be possible for large tech companies or governments to overcome Hayek's local knowledge problem or replace the price mechanism with big data analytics (Ezrachi and Stucke, 2016; Mayer-Schönberger and Ramge, 2018). This begs the fundamental question: how does data correlate to value? The simple answer is that the only reasonable way to speak about the size of data is in relation to the capacity of the tools needed to process it (Batty, 2015).

One way of understanding the role data plays in the information economy is that data is structured into information which can then be interpreted into knowledge and be put into action (which may generate new data). While data is a necessary source of value added, the actual value lies in the structure and interpretation, or processing, that turns data into information and knowledge (Tirole, 2017). Put differently, two firms may extract very different value added from the same data set. Consequently, it is not only the potential value of data that grows with its size but also the cost of structuring and processing it. In addition, data can hold a cumulative value over time because of potential patterns that emerge but it is also perishable, for example when it comes to understanding shifting preferences and demand to target ads. Large repositories of perishable data are of questionable value.

This, in turn, implies that it likely requires significant resources and economies of scale to balance the value added from data with the costs of structuring it. Also, the value added extracted from data does not necessarily grow steadily with size. While big data contains more potential patterns and insights to be unlocked, it also contains more noise and false patterns (Farnam Street, 2013; Wired, 2013). For instance, consider the risk of unknown biases in data that is used to train a machine learning application like the recruitment program developed by Amazon that consistently eliminated female applicants because of underlying bias in the training data (Reuters, 2018). Thus, data-driven innovative activities should not be expected to generate value in relation to the size of the data they depend on. Rather, innovation based on small but relevant data sets may prove to generate greater value than innovation based on large but noisy data sets.

The third paradox is that because data does not gain value from its size, which is cheap to scale, but from its structure, which is associated with a growing cost with size, large or growing firms are the ones with the means and incentives to build large data repositories. If these incentives are decreased or removed by regulation, for example to hinder large firms from gaining a competitive advantage through what is deemed unfair data-driven innovation, then the risk is that investments aimed at finding new patterns and insights in large data sets will topple.

There are straightforward ways to shift the debate from the size of data to the processing of data. For example, Tirole (2017, p. 406-407) suggests differentiating more clearly between on the one hand personal data and on the other hand the data generated by processing personal data which, he argues, belongs to the platform because it put in the work to structure and analyse it. While it is hard to make

such a differentiation in practice, it would certainly make it easier to promote portability of personal data between platforms while safeguarding privacy. This way, individuals are able to move their personal data and enable data-driven innovation on new platforms by voting with their feet, while platform companies retain the right to the value of their investment in structuring data.

3.4 Dominant position through network effects **or** because of regulatory burden?

One of the core arguments for the growing debate about competition in digital markets is that big tech companies have become too large through positive network effects, gaining dominant market positions. However, calls to regulate platform companies in order to prevent them from growing too big may result in creating or reinforcing precisely such dominant positions. The cost of regulatory compliance is in effect the price established firms pay for a regulatory moat and a significant barrier to new entries in their market.

Regulation shapes the organisation of innovation. Drawing a parallel to another part of the economy, new innovative drugs are increasingly developed by small biotech firms that sell or licence their innovations to big pharmaceutical companies. Smaller firms and startups lack the resources necessary to handle production, clinical trials, securing approval from regulatory authorities, marketing, and sales (Tirole, 2017). As the cost of regulatory compliance increases, it becomes harder or even less attractive for them to grow. Thus, the regulated market for new drugs favours vertical business integration in which small firms sell their innovations to, or are acquired by, a few large pharmaceutical companies.

The market for digital services has grown considerably both at its extensive and intensive margins and a few large platform companies – much bigger than their predecessors – hold dominant positions in their respective markets. These firms have become known for acquiring promising startups and innovations, possibly buying up some of their potential future competition but at the same time creating markets for further innovation and entrepreneurship. If this market concentration is due to positive network effects, it could be argued that the large firms are providing infrastructure and resources that allow acquired innovations or startups to scale in ways that would otherwise not be possible. This results in a skewed market distribution with a few large firms and a long tail of significantly smaller firms.

At first glance, this is the same market pattern that emerges between large pharmaceutical companies and small innovative biotech startups, with one important difference. In the pharmaceuticals industry, it is the static regulatory burden and not comparative advantages or economies of scale in a dynamic market that is the driving force of the market concentration. The regulatory burden may be warranted for the development of new drugs, but less so for digital services.

With respect to competition and competitiveness, the central issue should not be the skewed distribution in the marketplace, but its dynamics. There has evidently been turnover in digital platform services since the late 1990's, but how has it changed over time? Should the turnover rate be expected to slow down in proportion to growing market size? Are services being displaced through substitution or fragmented through competition from complementary niche services? Since many services are provided for free to end users, it is not the number of user accounts but how users allocate their attention that tells us something about the market dynamics. Network effects may change if people shift their behaviour and switch from one platform to another through multihoming or if the large platforms fail to balance positive against negative network effects, causing the quality of their matching services to fall. Regulatory burden, on the other hand, shifts slowly and amasses a cumulative competitive advantage through experience in compliance work. Thus, if large platform companies become increasingly regulated, this may contribute to decreasing dynamics and cementing a model of vertical business integration in their respective markets.

It is not surprising that some platform companies call for regulation in their own markets, especially with respect to new emerging technologies. It is reasonable to expect that new technologies will eventually become subject of regulatory effort as they mature and become integrated into the economy and society, but the need for regulatory adaptation must be balanced against the fact that regulation fortifies the position of the largest incumbent firms in the market. In the case of social media, further regulatory burden on platforms to decide what falls within the margins of free speech or to remove content risks forcing them to become judge, jury, and executioner – which most certainly makes them more powerful. While it is in their interest to try to maintain content quality and matchmaking quality in their respective platforms, regulating how they are supposed to do it raises the barriers to new entry and competition further.

The fourth paradox lies in the observation that the same market concentration and similar organisation of innovation can result either from network effects in the market, or through regulation aimed at removing it. The difference lies in the market's dynamics and ability to change.

3.5 Competition or innovation?

While there is a growing debate about high-tech competition, there also appears to be a growing consensus that the current antitrust toolbox and practices are not well-suited for the digital economy, and in particular for platform economies (Tirole, 2017; European Commission, 2020). Gilbert (2020) argues that there is a general agreement that antitrust laws have been designed to prevent harm to competition for existing products rather than to factors that may harm innovation or competition for new products. Against this backdrop, Gilbert advocates a shift from *price-centric* to *innovation-centric* innovation policy. This approach captures a central theme in the current competition debate: the concerns raised are not predominantly about prices or consumer surplus, but about future competition and innovation. For platform companies and markets with network effects this is natural since competition requires at least incremental innovation to create a comparative advantage for new entrants. The question is if competition policy is the best instrument to promote innovation, or if the best way to promote innovation through competition policy is by limiting its scope and not allowing it to swell.

There is no one-size-fits-all answer to what the relationship between competition and innovation looks like. In general, competition appears to promote innovation, but it is also clear that the effects are not homogenous across firms or industries. Empirical studies have found an inverted U-shape relationship between competition and innovation, as well as indications that increased competition may provide stronger incentives to innovate among firms close to the technological frontier because it allows them to “escape competition” (Aghion et al, 2005; Aghion et al, 2009; Autor et al, 2016; Gutiérrez and Philippon, 2017). Another study shows that growing competition may increase incentives to sell and acquire innovations, something that might otherwise be associated with insufficient competition (Norbäck and Persson, 2012). According to a Schumpeterian line of argument, larger firms with a dominant position may be better poised to invest in some forms of R&D and innovation (Bloom et al, 2019).

Thus, while there is clearly a relationship between competition and innovation, it is not simple or straightforward. It is, for instance, not clear that more competition will always yield more innovation even if everyone agrees that no competition at all will most likely obstruct innovation.

For innovation to be a priority in antitrust enforcement, there is a need for tangible indicators to evaluate and base a decision upon. This is, however, where the paradox comes in. We know little about where the next radical innovation comes from and if we tried to imagine it, we would be influenced and restricted by a frame of reference based on what we already know (Fagerberg, 2005; Verspagen, 2005). The idea

that we can project the scope of future innovation is associated with the notion of *weak uncertainty*, i.e. uncertainty based on knowable but currently unknown probabilities that could at least be estimated through statistical inference. With the assumption of weak uncertainty, investing more in R&D would be like buying more lottery tickets to increase the probability of winning. If, on the other hand, the uncertainty about future innovation is *strong*, the underlying probabilities of successful innovation shift over time and investing more is no guarantee of innovating more (Verspagen, 2005; Kay and King, 2020). Thus, rulings on how future innovation is affected by current competition or mergers will, at best, be biased towards incremental innovation. At worst, the ambition to define the market for future innovations in order to protect it could incur restrictions that impede or create inertia around potential innovations.

The fifth paradox is that trying to promote innovation through competition policy may prove to be inefficient or even counteractive because the relationship between the two is not as straightforward as it may seem. Innovation can certainly weigh in on antitrust enforcement decisions but if the ambition is to actively promote innovation there might be better options, for example expanding the funding and scope of basic research and the interaction between private and public R&D. While there is no linear model that guarantees innovation from basic research either, there will be significantly less innovation without basic research.

4. CONCLUDING REMARKS

The purpose of this paper is not to settle or discard any policy issues concerning digital platforms, competition and innovation, but to make a contribution to the ongoing discussion. Much of the academic understanding of multisided platform economies is fairly recent and it is still a research literature under development. There is need for a more nuanced policy approach that takes into account the ways in which multisided platforms differ from traditional business models, for which most policy measures were originally designed.

Drawing on empirical research insights from other sectors and traditional business models yields only limited applicability to the case of digital platform economies. Conversely, digital platforms generate a range of new, or at least slightly different, policy issues that need to be addressed and for which there is no precursor in research on other types of business models. For example, because of their reach, platforms contribute to harmonising markets across borders and increasing the degree of economic interdependence. But in doing so they also challenge the degree of national regulatory heterogeneity that each country can maintain while still being part of the harmonised economy. How will EU member countries strike this balance?

In summary, it is important to establish what we know, but also what we do *not* know in order to have an informed debate about the future role of digital platforms in the European digital economy. This paper contributes to the discussion by introducing five paradoxes derived from policy issues with contradictory implications or unarticulated trade-offs concerning innovation, competition and digital platform companies. The paradoxes are related to 1) acquisitions, 2) asymmetric pricing, 3) the value of structuring data, 4) market concentration, and 5) using competition policy to drive innovation. These platform paradoxes provide a basis for further discussions and research. Multisided platforms will continue to grow, permeate and reshape the economy. Improving our understanding of them as well as the policy toolkits needed to leverage them will therefore most likely remain a priority for the foreseeable future.

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