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Working Paper

The competitive landscape of online platforms

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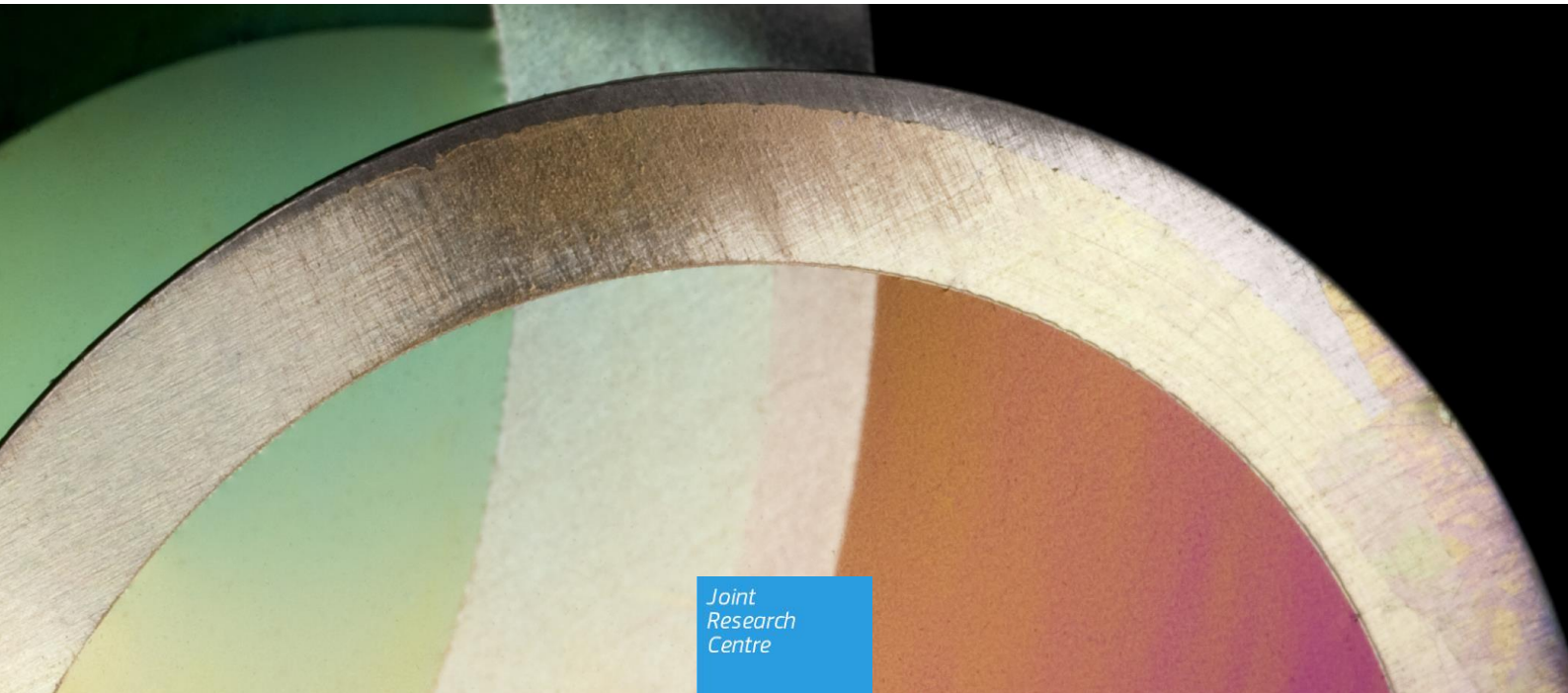
The Competitive Landscape of Online Platforms

Néstor Duch-Brown

2017



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Abstract

This paper describes the different forces that shape the market structure of four different 'online platform ecosystems' and the competition between them. The paper focuses on the following categories of platforms, which represent a wide scope of online activities: (i) e-commerce marketplaces; (ii) app stores; (iii) social media; and (iv) online advertising platforms. A central concern is to provide descriptive, empirical evidence on the relative strength of the forces operating in each case. In the past decade or so, many theoretical and conceptual contributions have been very helpful in developing a clear understanding of many of the issues around multi-sided markets, and have analysed these activities from many different perspectives. Unfortunately, they have provided hardly any empirical evidence. This paper attempts to reduce the lack of empirical evidence available on online platforms.

1 Introduction

The main objective of this working paper is to describe the different forces that shape competition with regard to several categories of online platforms, or between different 'online platform ecosystems'[1]. In so doing, a central concern is to provide descriptive, empirical evidence on the relative strength of the forces operating in each case. The paper focuses on the following categories of platforms, which represent a wide scope of online activities:

i. e-commerce marketplaces;
ii. app stores;
iii. social media; and
iv. online advertising platforms.

One characteristic of the digital economy is the proliferation of platforms. These online intermediaries are considered to be multi-sided markets in that they act as entities which enable interactions between users located on different sides of a given transaction. This intermediation process can lower search costs for both sides, and improve the match between agents at different ends of the exchange. In principle, due to direct and indirect network effects more agents will be willing to participate and entry will be promoted, stimulating innovation and generating business opportunities for SMEs. However, in most segments of the digital economy, a limited number of successful companies have grown to a considerable size and have come to dominate their activity space, leaving only limited room for a relatively small competitive fringe.

In its assessment of online platforms, the Commission detected the existence of potentially "unfair" trading practices (UTPs) imposed by these intermediaries. These could be particularly burdensome for small users, normally micro enterprises and small and medium companies (SMEs), which use platforms to reach customers. Some of the most relevant B2B UTPs identified during the public consultation on platforms are that they:

i. impose unfair terms and conditions;
ii. refuse market access or unilaterally modify the conditions for market access;
iii. promote their own services unfairly;
iv. insert unfair "parity" clauses; and
v. lack of transparency.

These UTPs are independent of dominant positions from a competition law perspective. This working paper aims to analyse more generally the space in which the various types of platforms operate.

UTPs can introduce important distortions in the efficiency of the exchanges or transactions intermediated by platforms. Efficiency losses can be due to increased uncertainty, higher transaction costs, lower competition from blocked entry of new platform participants, which would imply higher prices and less choice for consumers, among others. However, the competitive landscape and characteristics of different operators in each category are different. Hence, there is a need for a comprehensive analysis of the relevant typologies. All these are clearly empirical questions, since in each category the balance of forces can go either way.

[1] The use of the notion of an ecosystem is helpful since it draws attention to the set of players – platforms, users, buyers, sellers, regulators and others – who jointly, through their competitive and cooperative interactions, produce a set of products and/or services. These interactions make up the key characteristics of the system, and facilitate an understanding of its evolution.

Many theoretical and conceptual contributions have been very helpful in developing a clear understanding of many of these platforms, and have analysed these activities from many different perspectives. Unfortunately, they have provided hardly any empirical evidence. Apart from a nascent literature on the sharing economy that studies some online platforms[2], the rest of the available empirical evidence on platforms refers almost exclusively to traditional (or offline) two-sided markets (media, credit cards, software). For example, despite its importance, there are no empirical estimates of the extent of indirect network effects in online platforms or detailed analysis of how these platforms modify the ecosystem in which they operate.

The paper is structured as follows. Section 2 discusses the main forces at work in the delineation of platform ecosystems. Section 3 describes the characteristics of the different types of platforms considered. Section 4 offers some conclusions.

2 The forces at work

The competitive landscape of multi-sided markets is determined by several factors. The most relevant are: (indirect) network effects, economies of scale, multi-homing possibilities, capacity constraints, and differentiation (Evans and Schmalensee, 2007). From an economics perspective, a market is typically called two-sided (or multi-sided) if indirect network effects are of major importance[3]. Indirect network effects can be distinguished from direct network effects, which are directly related to the size of a network. 'Direct network effects' mean that the utility that a user receives from a particular service directly increases as the number of other users increases (Katz and Shapiro, 1985).[4] In contrast, indirect network effects arise only if the number of users on one side of the market attracts more users on the other side. Hence, users on one side of the market indirectly benefit from an increase in the number of users on their market side, as this increase attracts more potential transaction partners on the other market side. While there is no direct benefit from an increase in users on the same market side, the network effect unfolds indirectly through the opposite market side. For example, consider an e-commerce marketplace: more potential buyers attract more sellers to offer goods on the platform since the likelihood of selling their goods increases. On the other hand, competition among sellers of the good becomes more intense with an increased variety of goods offered, making the trading platform more attractive for more potential buyers (Rochet and Tirole, 2003).

These network effects imply that the efficiency and user benefits of platforms increase with their size. In multi-sided markets, it is not sufficient for the platform operator to attract only users from one market side to join the platform, as there is an interrelationship between the user groups on both market sides. Neither the buyer side nor the seller side of the market will be attracted to join the platform if the other side of the market is not large enough. In order to solve the "chicken and egg" problem (Caillaud and Jullien, 2003), platforms have traditionally subsidised access for one type of user –normally the side that is more responsive to price changes. They have financed this subsidy by charging the group of users on the other side that is less price sensitive. The magnitude of network effects varies widely across platforms and is an empirical question. Hence, high market concentration levels cannot simply be interpreted in the same manner as in conventional markets without network effects (Wright, 2004).

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[2] See Codagnone and Martens (2016) for a comprehensive review. In particular, Section 2.2 (pages 13-18) is devoted to the empirical evidence.

[3] More generally, a platform is characterised by the fact that behaviour on one side affects behaviour on the other side. Indirect network effects is one channel, there may be others.

[4] A classic example where direct network effects operate is the telecommunications industry where a service is more attractive for users the larger the number of other users, as the possibility to communicate increases with the number of users.

Most online multi-sided markets are characterized by a cost structure which has a relatively high proportion of fixed costs –particularly related to R&D activities- and relatively low variable costs (Jullien, 2006). This should lead to economies of scale at least over some ranges of transactions. For instance, the costs of developing, establishing, and maintaining the algorithms and databases needed to operate are, to a certain extent, independent of the volume of transactions. Economies of scale are, therefore, rather typical of multi-sided markets. This cost structure[5] implies that traditional marginal cost pricing can no longer be used, and alternative pricing schemes are needed. Moreover, since there may also be economies of scale on the demand side (due to direct network effects), pricing decisions have to take into account both sides of the platform (Evans and Schmalensee, 2007). What matters in platforms is the price structure, i.e., the relationship between the prices charged to every side. Hence, different business models for attracting consumers and suppliers typically co-exist in the market (Rochet and Tirole, 2003). These models are mainly differentiated by which side of the market is charged the most by the platform. Whether users can capture value or not in the system depends on their bargaining position inside the platform (within-platform competition) and the strength of the competition with other platforms (between-platform competition).[6]

While both (indirect) network effects and economies of scale lead to higher concentration levels, there are also other forces that work in the opposite direction (Evans and Schmalensee, 2007). One important countervailing force is related to capacity constraints. While in physical two-sided markets (i.e. a shopping centre) space is physically limited, this does not necessarily hold for online two-sided markets. However, advertising space is often in fact restricted since too much advertising can be perceived as a nuisance by users and therefore decreases the platform's value in the recipients' eyes (Becker and Murphy, 1993; Bagwell, 2007). Similarly screen size, especially on mobile devices, may reduce advertising space and the variety of products that can be meaningfully displayed. In some electronic two-sided markets, capacity limits can also emerge as a result of negative externalities caused by additional users. For instance, if additional users make the group more heterogeneous, users' search and transaction costs may increase. In contrast, the more homogeneous the users are, the higher a given platform's value for the demand side will be. If, for example, only certain people visit a particular platform (some platforms are specialised, for example for academics), targeted advertising is much easier for advertisers. This reduces the search costs for all visitors involved. Additional users would make the user group more heterogeneous and not necessarily add value, as increased heterogeneity also increases the search cost for other users. However, in many instances, the use of data to personalise offers and/or advertising, for instance, can be used to overcome the effects of capacity constraints.

The degree of differentiation between platforms is also relevant. In some cases, consumer preferences are sufficiently heterogeneous to allow some product differentiation to emerge (as in dating sites, magazines or newspapers). This differentiation can be vertical (e.g., the advertising industry may find high-income users more interesting than a low-income audience), and/or horizontal (e.g. people interested

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[5] Recently, data has been identified as a strategic variable, affecting many aspects of the operation of platforms and their competitive frameworks. A detailed analysis of this issue lies outside the scope of this paper. See Duch-Brown et al. (2017) for a comprehensive exposition of the topic.

[6] In many cases, platforms do not operate in isolation, and there are many competitors from traditional markets. This balance between offline and online is often neglected in the analysis of platforms. However, in the case of marketplaces, for instance, total online sales represents only 7.5% of retail sales in the EU, and the share of platforms is much less.

in sports newspapers versus people interested in financial newspapers)[7]. The higher the degree of heterogeneity among potential users, the easier it is for platforms to differentiate. In this scenario, diverse platforms will emerge which target specific niches. Thus, it is less likely that a unique leading platform will emerge within the ecosystem[8]. Finally, and as exemplified by Google or Facebook, the cost of expanding a digital offering to cater for a different audience may be lower than in conventional businesses.

In settings where a multiplicity of platforms co-exists, horizontal differentiation can result in customers choosing to join and use several platforms, a phenomenon called "multi-homing" (Rochet and Tirole, 2006). How easy it is for consumers to multi-home depends, among other things, on the nature of the alternative platforms (substitutes or complements), switching costs between platforms and the pricing policy (usage-based tariffs or flat rates) of the platform. Many information products and technologies are associated with switching costs, i.e. buyers must bear these costs when they switch from one product to a functionally-identical product supplied by another firm. Switching costs arise when a consumer makes investments specific to buying from a particular firm, making it more valuable for the consumer to buy different goods, or goods at different dates, from that particular firm. Multi-homing can occur on both sides of the platform, just on one of them, or be impossible.

Most –if not all- online intermediaries provide a search environment designed to facilitate matching between the different sides. These in-platform search engines aim to lower the search costs incurred by users when they try to find a suitable match on the other side of the market. The way these "black-boxes" work remains an open question, as platforms do not disclose the design of their search tool. Concerns about search bias have arisen, based on the idea that in-platform search tools could have been designed to maximise the profits of the platform and not necessarily to reduce the search costs of the participants on the platform.[9] Several studies have analysed this issue (see among others Ursu, 2015; Fradkin, 2014; Cullen and Farronato, 2015). As an example, when consumers decide how many sellers to evaluate (extensive margin) and how deeply to evaluate each of them (intensive margin, defined by the number of attributes, for example), it has been found that the equilibrium search environment embeds sufficiently high search costs to prevent consumers from evaluating too many sellers. At the same time, search costs are sufficiently low to allow consumers to carry out in-depth evaluation of the chosen ones. In other words, the extensive margin is narrow, but the intensive margin is wide (Dukes and Liu, 2016).

As a consequence of the relative strengths of these forces –and their interactions- online platform ecosystems are prone to the appearance of leading players[10]. However, this is not necessarily the case for all activities involving platforms, because the balance

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[7] An additional dimension could be based on the rules followed or imposed by the platforms and/or the types of interactions they promote (for example Facebook vs Twitter, Couchsurfing vs Airbnb).

[8] The finding that increasing returns to scale foster market concentration while product differentiation and heterogeneity of user preferences work in the other direction is not new, but well known from the economics literature (Dixit and Stiglitz, 1977; Krugman, 1980).

[9] See, for example, the recent statements made by Chancellor Merkel on algorithmic transparency, (https://www.theguardian.com/world/2016/oct/27/angela-merkel-internet-search-engines-are-distorting-our-perception), as well as the Commission's Communication on online platforms (Online Platforms and the Digital Single Market Opportunities and Challenges for Europe, COM(2016) 288 final). The Commission will in this regard carry out, on behalf of the European Parliament, a pilot project on algorithm awareness building over the next two years.

[10] High concentration levels that result from indirect network effects are not an entirely new phenomenon which has only emerged in Internet markets. For instance, the existence of one large physical marketplace is often efficient from an economic perspective, as it helps to reduce search and transportation costs.

resulting from the interplay of all the forces involved will differ between activities[11]. The presence of indirect network effects is by no means sufficient for a monopoly or even high levels of market concentration to emerge. On the other hand, it is not even clear whether competition between several platforms is necessarily welfare enhancing when compared to a monopolistic market structure: the existence of multiple platforms may not be efficient due to the presence of indirect network effects. A monopoly platform could be efficient because network effects are maximized when all agents manage to coordinate over a single platform. Hence, strong network effects can easily lead to highly concentrated market structures, but strong network effects also tend to make these highly concentrated market structures efficient.

The available evidence[12] on the relative strength of these forces would suggest that, if left alone, they create closed ecosystems. The effects of such ecosystems on innovation are not yet well understood, because they develop their own services and content and prevent competing services from accessing the platform(s), or reduce the quality or compatibility of the competing services. These closed platform ecosystems can be good for competition, since they increase intersystem competition –leading to fierce competition 'for the market' – generating enlarged incentives to innovate and to entry due to future profit expectations. Alternatively, an open platform ecosystem achieves the full benefits of network effects and economies of scale for component makers, increases intra-ecosystem competition and stimulates market entry through component innovation. However, there is as yet no clear benchmark for efficient market structure in digital platform markets. Digital markets are characterized by fast innovation, that can rebalance leadership and facilitate entry. Most big players cannot be complacent and have to constantly strive to preserve their positions by preventing other firms from innovating faster.

A recurrent economics question is: what is the exact definition of a relevant market in which these platforms operate? Two-sided network effects create significant barriers to entry, giving a strong advantage to incumbents. Nevertheless, as technology changes rapidly, incumbent advantages can also be quickly reduced. When we talk about rapidly changing technologies, it is sometimes difficult to delineate a sector and hence define what its entry barriers are, to identify the incumbents and thus have a proper market definition. However, attempts have been made (Filistrucchi et al., 2014). In traditional competition analysis, the market definition process aims to reveal the products and firms which are likely to be affected by a merger or an abuse of dominance. A popular approach in both academia and practice is the SSNIP test[13]: if a firm were (hypothetically) in the position to profitably raise its prices permanently by, say, 5% above the current price level, the firm is considered to be ineffectively constrained by competition forces. If, in contrast, a price increase of this amount is unprofitable, these alternative products are considered to belong to the same product market[14]. In online activities, this market definition process becomes much more complicated for two main reasons. First, in many online markets, consumers do not pay a positive price, at least

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[11] Counter-examples are online real estate brokers, travel agents, and many online dating sites, where several competing platforms coexist. For instance, http://www.europetopsites.com/ lists close to one thousand European real estate websites; http://www.travel-lists.co.uk/travel/listings/categories/miscellaneous/online-agencies includes more than 130 online travel agencies operating mostly in Europe while http://whiteskyhospitality.co.uk/the-giant-list-of-online-travel-agencies-an-introduction/ provides a list of more than 400 OTAs worldwide; and http://www.leadingdatingsites.co.uk/all-dating-sites-list.htm links to more than 170 online dating sites.

[12] See, for instance, Parker and van Alstyne (2005), Armstrong (2006), Haucap and Heimeshoff (2014), and SWD (2016) 172 final.

[13] Small but Significant Non-transitory Increase in Price.

[14] For example, because consumers switch to alternative products they consider to be sufficiently good substitutes.

not in monetary terms[15]. Therefore, a test of a price increase cannot simply be computed as long as the starting price (in money) is zero[16]. Second, the profitability of a price increase on one market side also depends on user reactions on the other market side and the induced feedback effects, as a consequence of the indirect network effects. This two-sided market structure causes another problem: it is not clear which price should hypothetically be increased in a market definition exercise. Should only the price on one market side be increased, or all prices simultaneously?

The peculiar nature of platform ecosystems, where businesses and users engage in many different types of activities -often complementary to similar offline activities- creates a context where changes in a platform's price structure may damage the quality of the service. This would be especially harmful in contexts where users do not multi-home, i.e., they do not perceive platforms as complementary products/services. These arguments render the SSNIP test inapplicable in the case of platforms. A variation of the test has been recently suggested (Gal and Rubinfeld, 2016), particularly for markets in which goods/services are provided for free. The test evaluates the market boundaries by measuring the effects of small but significant and non-transitory changes in quality (SSNIQ). This test examines switching once quality is reduced (rather than when price is increased). While differences in quality are more difficult to measure and quantify than differences in price, consumer behaviour may still provide rough indicators about their preferences when quality changes.

Finally, just as digital technologies change rapidly, so do the markets where these platforms operate. We are already seeing that some platforms overlap (online advertising and social networks, for instance), and some platforms operate on top of other platforms (such as data platforms on top of commercial platforms or app stores on top of operating systems platforms). In addition, constellations of platforms, where many platforms are connected to each other are emerging (online advertising platforms and social networks or search engines appear to be naturally linked to each other).

It is well known that competition is a multidimensional issue. Hence, achieving a large market share is not the only important issue, other aspects may play a role as well. For instance, financial strength has been shown to lead to systematic future market share gains at the expense of rivals. This effect tends to be stronger when rivals face tighter financing constraints and when the number of interactions between competitors is large. Overall, the results in the literature suggest that access to finance encompasses a substantial strategic dimension. In the case of platforms, incumbents have relied on their financial advantage to absorb small competing entrants or potential status-quo disruptors. Similarly, financial strength can be an advantage when competition requires big investments in infrastructure or R&D. In the case of infrastructure, control over relevant facilities can be an advantage not necessarily related to traditional measures of market performance. The traditional approach ignores relative dominance and its effects in situations where a market participant enjoys a superior bargaining position towards its business partners and uses it to its advantage. In some situations, however, although an undertaking does not enjoy a dominant position in a relevant market, it may have a stronger economic position vis-à-vis its trading partner. Unbalanced bargaining power may also arise in situations where a weaker economic partner depends on a stronger

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[15] Instead, consumers pay an implicit price in the form of personal data and/or attention (Evans 2013).

[16] Even if one would want to consider a 5% increase of the implicit price that consumers pay, namely their disclosure of personal data and/or their exposure to advertising, it is, in practice, rather unclear what this 5% increase of advertising exposure or data disclosure would mean. Alternatively, one could assume passing from a zero price scenario to a positive price scenario, i.e., considering an absolute change instead of a relative change.

partner in order to exercise its freedom to compete in the market. An abuse of relative market power of this kind may affect the freedom of the weaker party to compete[17].

3 Online platforms

This section describes the different types of platforms considered. In each case, the forces at work are highlighted and, where possible, backed with (indirect) evidence. This exercise helps us to detect differences and similarities within and between the categories of online platforms that could eventually shed some light on their future evolution. The different configurations of the strengths of the forces at work also imply differences in the likelihood of market concentration in each case. They also determine the size of the entry barriers. Table 1 summarises the forces at work and the observed effects on each platform.

Table 1: Summary of the strength of competitive forces in the different types of platforms

Forces*	**Platforms**			
	Marketplaces	**App stores**	**Social networks**	**Online advertisement**
Network effects	**Direct**: low for sellers and buyers **Indirect**: high for sellers and buyers	**Direct**: high for users, low for developers **Indirect**: high for users and developers	**Direct**: high for users; low for advertisers **Indirect**: low for users, high for advertisers	**Direct**: low for users, publishers and advertisers **Indirect**: low for users, high for publishers and advertisers
Economies of scale	High	High	Medium	High
Capacity constraints	Medium	Medium	High	High
Differentiation	High	Medium	High	High
Multi-homing	Medium for buyers; low/medium for sellers	Low for users; medium for developers	High for users and advertisers	High for users and advertisers, medium for publishers
Main players	Amazon, ebay, booking.com	Google Play; Apple App Store	Facebook; LinkedIn; Instagram	Doubleclick; AppNexus; Rubicon Project

* The definition of these forces can be found in the text.
Source: own elaboration with information extracted from the references.

Although all of these platforms are important players in their respective categories, they differ in the market power they have achieved, and in the bargaining power they may exert on both sides of the market. The economic theory of two-sided markets has typically modelled platforms as passive actors that merely set prices and provide a centralised place for different types of agents to meet[18]. The table indicates that the importance and the intensity of the different forces vary substantially by platform type. As enablers, platforms can also manipulate other instruments in order to select their

[17] The concept of abuse of economic dependence is not recognised in EU competition law. However, some EU Member States, such as Italy, Germany and France, have in their competition law provisions that deal with uneven bargaining power

[18] From an historical perspective, traditional microeconomic theory evolved in a similar way. First, the theory of markets was developed considering the firm as a black box. Then, the theory of the firm was developed.

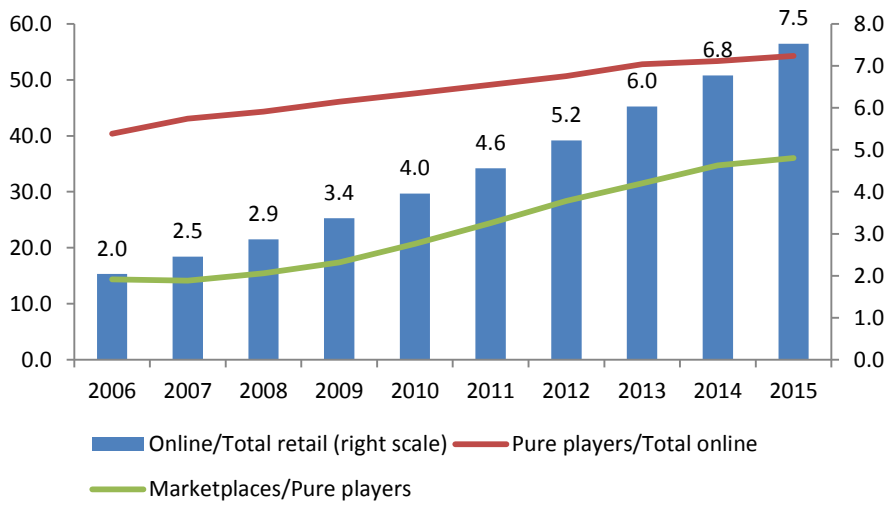
user base. Platforms develop matching technologies, devise rules for agent behaviour, and provide auxiliary services to agents in their transactions, in order to minimise matching frictions. In the following sub-sections, a more detailed analysis and explanations are provided.

3.1 E-commerce marketplaces

The growth of electronic commerce has facilitated the emergence and increasing popularity of third-party electronic marketplaces. An electronic marketplace (EM) provides opportunities for conducting business in the same way as a traditional market except that the transactions are executed via electronic channels, usually an internet-based platform. The unique feature of an EM is that it brings multiple buyers and sellers together in one central market space. While there are pure EMs – booking.com is an example – other such marketplaces are associated with firms that also operate a more traditional online retail business, like Amazon, a business model referred to as "dual format". In addition, ebay recently introduced a shopping assistant within Facebook Messenger, which places two online platforms between third-party sellers and buyers on ebay and potentially increases the lock-in effects for professional sellers (who may face difficulties obtaining data on their – potential – customer base).

EMs operate in broader industry configurations. In many product categories, customers shopping for a product have the option of buying it directly from a traditional bricks-and-mortar retailer, or through online sellers. In the former case, they then have to choose between specialist merchants or mixed retailers. If customers select an online vendor, they can opt for an e-tailer or an EM. They may also have to make this choice if they purchase a service, like a hotel reservation or a car rental. During the last 15 years online trading platforms have become increasingly popular. In the EU in 2015, retail EM represented 19.6% of total online retail, up from 6.9% in 2006. However, the share of online retail on total retail is still weak, at around 7.5% in 2015 (figure 1). Hence, despite impressive growth rates in both e-commerce and EM participation, retail EM is still a minor channel for the distribution of goods in the EU.

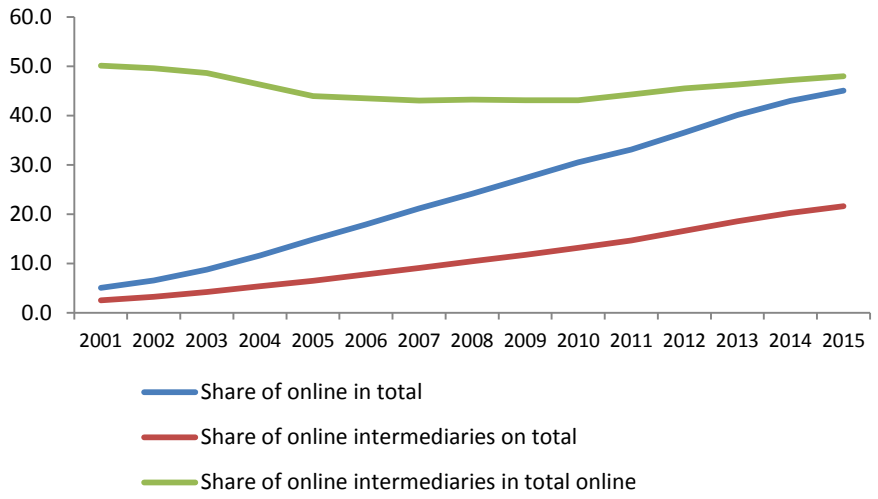
Figure 1: Evolution of e-commerce in goods in the EU-28



Left scale: percentage over online retail (red line), and percentage over pure players total turnover (green line). Right scale: percentage over total retail.
Source: own elaboration with data from Euromonitor International: Passport 2016 Edition.

Concentration levels in online retail are rather high. In the EU, the top 25 online retailers in 2015 made 48% of overall EU-28 sales[19], while the top 5 made 31.3%. Of these five, retail EM occupy positions 1 (Amazon) and 3 (ebay). Looking exclusively at retail EM, Amazon and ebay represented 90.2% of the segment in 2015, up from 88.5% in 2006. However, the distribution of the share each company holds has changed significantly. In 2006, ebay represented 78% of the market while Amazon covered only 10.5%. In 2015, ebay's share decreased to 34.9% while Amazon's market participation escalated to reach 55.3% (Figure 3)[20]. At the same time, the number of retail EMs ranked among the top EU online retailers passed from 2 in 2006 to 17 in 2015. Hence, there has been significant entry[21] in this sector, despite the presence of strong indirect network effects[22]. Similar evolution and conclusions can be drawn by looking at other EMs. Figure 2 shows the evolution of e-commerce in the travel industry, and separates the share of online intermediaries (such as booking.com or Airbnb) in the total turnover of the sector and in the online turnover.

Figure 2: Evolution of e-commerce in travel services in the EU-28



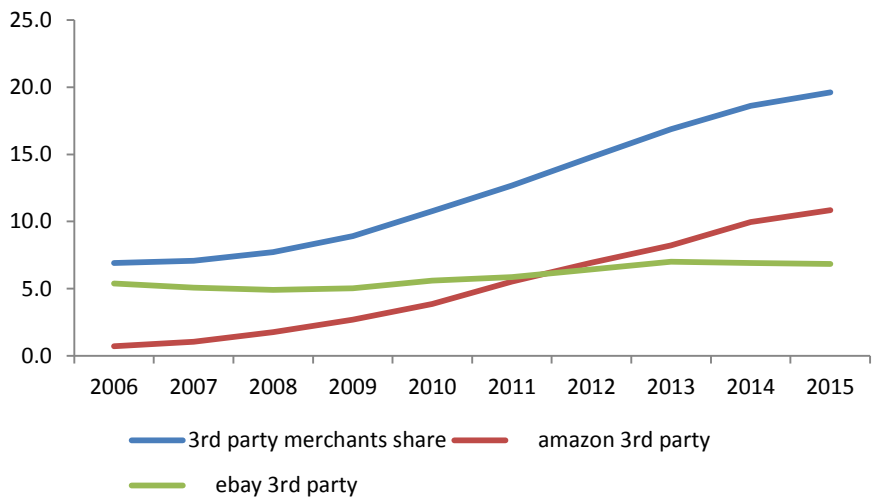
Left scale: percentage over total turnover in travel services. *Right scale*: percentage over total online travel turnover.
Source: own elaboration with data from Euromonitor International: Passport 2016 Edition.

One important question for this analysis is how easy it is for sellers and buyers to engage in multi-homing, i.e. how easy it is for them to use competing online trading platforms in parallel. For many sellers it is not as attractive to engage in multi-homing as it would first seem, for a number of reasons. First of all, multi-homing is difficult for small sellers because they often sell unique items and benefit heavily from a large group of customers to find buyers for their products. Additionally, it is difficult to build up reputation on several platforms, as reputation depends on the number of transactions a

[19] A table including the top 25 online retailers in the EU-28 can be found in the Annex.
[20] All calculations have been made using data from Euromonitor.
[21] Since there is no sufficient information, it is difficult to assess whether the increase in the number of EM in the top EU retailers is due to the lack of strong entry barriers, or to the lack of strong mobility barriers, ie, factors that impede that small firms become larger. Another important reason may be that the online segment has simply expanded, including with specialised EMs, to the detriment of offline commerce. Recent research has shown that the appearance of the online channel has important "business stealing" effects with respect to offline (Duch-Brown et al., 2015).
[22] As stated before, there is no empirical measurement of the strength of these effects in EM, yet.

seller has already honestly completed on a given network[23]. Transferring reputation from one platform to another is rather difficult or often even impossible. Hence, a seller's investment in its reputation is typically platform-specific. Furthermore, sellers which use smaller platforms run the risk of selling their products at below market value, as the price mechanism works best with a sufficiently large number of market participants on both sides of the market. Finally, certain online platforms try to lock-in business users by technological means, for example by imposing the exclusive use of a proprietary booking tool (Armstrong and Wright, 2007; Doganoglu and Wright, 2010). Hence, multi-homing is reasonably difficult for sellers. This limits their bargaining power and it seems that most of the time they face "take-it-or-leave-it" decisions about accepting the terms and conditions imposed by the platforms.

Figure 3: Penetration of electronic marketplaces in total online retail, EU-28



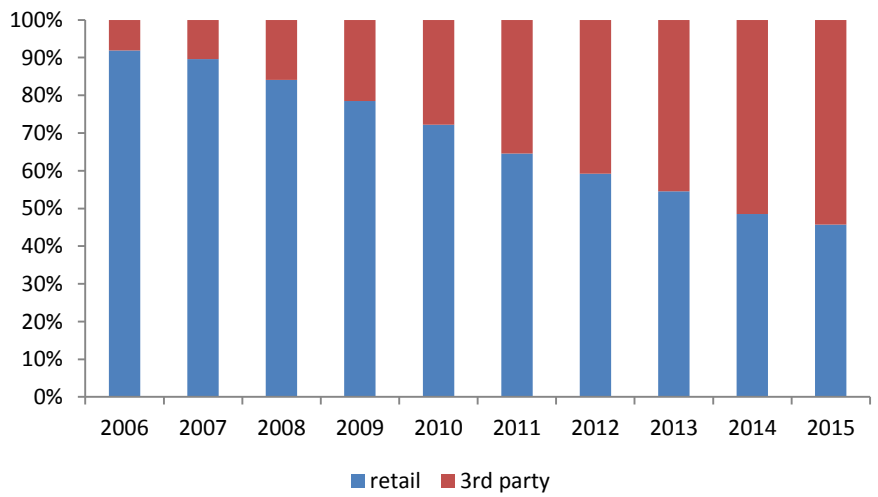
Note: 3rd party merchants refers to independent sellers on electronic marketplaces. The vertical axis refers to the share of revenues of EM over total online retail sales.
Source: own elaboration with data from Euromonitor International: Passport 2016 Edition.

The reputation mechanism also works for buyers to some degree even though it is less important than for sellers. The lock-in effect is, therefore, typically lower for buyers who can more easily decide to multi-home, i.e., buy from an alternative platform if the product they are looking for is also on sale elsewhere[24]. In addition, recommendation services reduce search costs for buyers, and can have both positive and negative impacts on demand. On the one hand, recommendations can reinforce the lock-in effect through the availability of data used On the other hand, they can also make buyers more aware of the true characteristics of the products and, in some cases, buyers will discover the product is not to their taste. However, as long as sellers do not switch to other trading platforms, consumers benefit very little from searching through other trading platforms. In addition, the design of online trading platforms, their market rules, and the management of the platforms, among other issues, usually differ and, as a result, buyers also face switching costs if they decide to use another platform as they have to get used to the terms of the new platform. Many EMs also try – sometimes hard – to create endogenous switching costs in order to bind customers[25]. For instance, data collection by some EMs regarding payment/address/buyer characteristics enable one-click shopping which may increase switching costs for those who value that option. In

[23] In fact, a good reputation on ebay translates into higher prices for sellers, as has been documented by Melnik and Alm (2002).
[24] In contrast, in the collaborative economy mutual trust is crucial.
[25] For example, the so-called eBay university offers courses how to use eBay more efficiently.

addition, the increasing importance of mobile commerce can also imply that, with limited device capacity, users may want to install only the preferred EM apps and not all of them, which can also affect switching costs. Overall, both Amazon and ebay clearly have significant bargaining power over their business users in the EM segment. Due to sellers' specific reputations, indirect network effects, and switching costs, existing large EMs are unlikely to lose their strong positions in the foreseeable future. Online retail sales are expected to maintain a two-digit growth rate in the period 2015-2020 of about 10% per year, while total retail is expected to grow at 1.3% per year in the same period. Hence, we will see a consolidation of the role of EMs in the coming years, as exemplified by the changing structure of Amazon's two business lines (Figure 4): the EM business is increasingly important and in 2015 represented more than half of the revenues.

Figure 4: The changing structure of Amazon: retail vs. marketplace



Note: the figures indicate the share of each business line in the company's total turnover.
Source: own elaboration with data from Euromonitor International: Passport 2016 Edition.

3.2 App stores

Although the mobile apps industry began with Apple's introduction of the iPhone in 2007, the phenomenal growth observed over the past few years is due to the entry of several competitors into the marketplace (most notably HTC, Huawei, LG, and Samsung). This competition has given rise to an entirely new product space for smartphones, which have far greater functionality than normal mobile phones due to their ability to run mobile apps. These applications give smartphones the capability to send and receive e-mail, play music, movies, and video games, and even communicate remotely with computers from virtually anywhere in the world. The development of apps and online app stores moreover currently already extends far beyond smartphones, to virtual/augmented reality gear, game consoles, and other types of connected hardware (such as smart watches). With the arrival of the IoT, the importance of app stores or similar online distribution ecosystems is likely to grow yet further.

Smartphones and similar connected devices contain many of the same components as personal computers. Every smartphone has a processor, random access memory (RAM), USB ports, display adapters, and internal storage devices. Users may even customize and upgrade their devices to suit their individual needs. For example, a user who wishes to use the smartphone for gaming can purchase a device with a multi-core processor and additional storage to hold large games, or with hardware add-ons like the Hi-Fi Plus DAC for the LG G5. Most smartphones are also equipped with a touchscreen, which obviates the need for a physical key board. Table 2 shows the evolution of the EU smartphone

market by operating system (OS). The table clearly illustrates the consolidation of both iOS and Android as the main OS, both by volume and revenue.

The core software found in a smartphone is called the operating system. The operating system contains all the drivers necessary to carry out instructions between the software and hardware of the device. The application suite contains core applications which are packaged with the operating system by default. These applications include phone call software, text messaging, menu screens, calendars, and more.

A mobile app is software that a user can install on a smartphone to perform a particular task.[26] Mobile apps are mainly distributed through app stores[27]. These are basically platforms connecting app users (smartphone owners) and app developers[28]. The app store ecosystem is complex, and many typologies have emerged. It is possible to distinguish between native app stores that belong to the major mobile OS developers, from third-party app stores. This last category is populated by manufacturer-specific app stores (Samsung, LG, Motorola, Lenovo among the most important), operator- or carrier-specific apps stores (Vodafone in many EU countries, T-mobile in Germany, TIM store in Italy, for instance) and also cross-platform third-party apps stores. Despite this multiplicity, users' preferences have consolidated around two main OS, and over two main apps stores, making competition extremely difficult for the smaller apps stores. Differentiation beyond the existing app stores seems unlikely (at least within the smartphone market).

Table 2: Smartphone* market share in the EU, by Operating System

	Volume			**Revenue****	
	2008	**2012**	**2015**	**2012**	**2015**
Android	2.7	57.8	68.1	41.3	50.6
iOS	12.3	22.0	21.0	26.7	41.9
Windows	12.3	9.3	9.5	2.4	3.9
BlackBerry OS	12.8	5.2	0.8	6.1	0.4
Symbian	54.2	4.7	0.0	4.3	0.1
Other	5.7	1.0	0.6	19.2	3.1
Total	100.0	100.0	100.0	100.0	100.0
Smartphone share***	11%	63%	87%	n.a.	n.a.

* The figures in the table refer to smartphones only, and do not include feature phones. The last row of the table shows the penetration of smartphones in the overall mobile phone industry.
** These shares are computed from sales data of the top 10 EU countries, representing more than 85% of total EU sales.
*** This figure refers to the number of smartphones sold in the reference year over total sales of mobile phones, in percentage.
Source: Euromonitor International Passport 2016 Edition for volume and GfK for Revenue.

The initial proliferation of app stores also reflects the explosion of new apps, which can only be expected to continue as smartphone usage grows globally. In the EU, in 2015, 150 million smartphones were sold –representing 87% of the mobile phone market-, and this figure is expected to grow, albeit slowly, in the coming years. Today, the two main

[26] An important feature is that, different from websites, apps are not hyperlinked but heavily segmented. This makes the app ecosystem more closed than the website ecosystem. Some recent technological developments, in particular Google's app streaming possibilities, may help reduce this severe fragmentation.

[27] As an alternative to "native apps", i.e., those that are built for a specific platform (iOS or Android), web-based apps are hosted on the web and accessed from a browser on the mobile device.

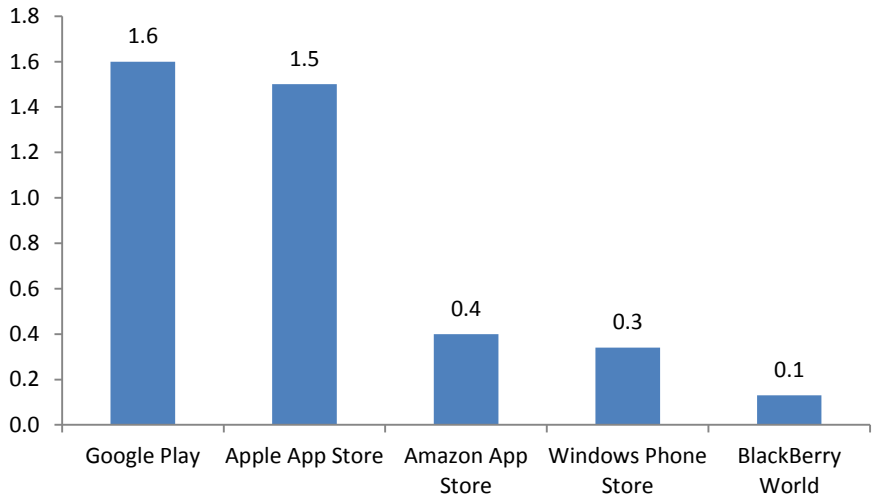
[28] Other sides of the platform could be app publishers and app marketing services.

app stores include more than 1.5 million different apps each (Figure 5). Users mostly want game apps, both free and paid-for. Facebook, Google Maps, and the Weather Channel were the most popular apps across all platforms. In social networking, Facebook was by far the most popular app, while Amazon and ebay led the shopping category, reflecting the linkages between different platform ecosystems (Figure 6).

When they have to make a decision about purchasing a smartphone, users tend to pick a single platform based on the value they expect from the OS and from the apps available for that particular OS. From this perspective, users' multi-homing is limited to the corresponding OS app store, the smartphone manufacturer app store or possibly the network operator app store. Developers, on the other hand, can in principle multi-home, i.e., they can develop versions of their apps that can be installed in different OS. In some cases, there are exclusive apps, i.e., apps that only work on a specific OS. However, Hyrynsalmi et al. (2016) assessed multi-homing in mobile application ecosystems with data from nearly 1.3 million applications from Apple's App Store, Google Play, and Windows Phone Store. Their results demonstrate that only a small subset of all software applications and developers multi-home, i.e., they are present in several app stores simultaneously. However, focusing only on the most popular applications and their developers, they show that multi-homing rates are quite high.

From the developers' perspective, there are costs involved in the creation of apps, and in making these apps available on different platforms. Apps for different app stores have to be written using specific code libraries (Swift or Objective-C for iOS/Java for Android) using app store-specific Software Development Kits. Targeting multiple app stores involves significant effort in re-writing or modifying the apps so that they can be included in the corresponding app store. There is an additional cost involved in keeping up with the different OS updates. Moreover, once available in one app store, the app's reviews and related information cannot be easily ported from one app store to the other.

Figure 5: Number of apps available in leading app stores as of July 2015 (Million)

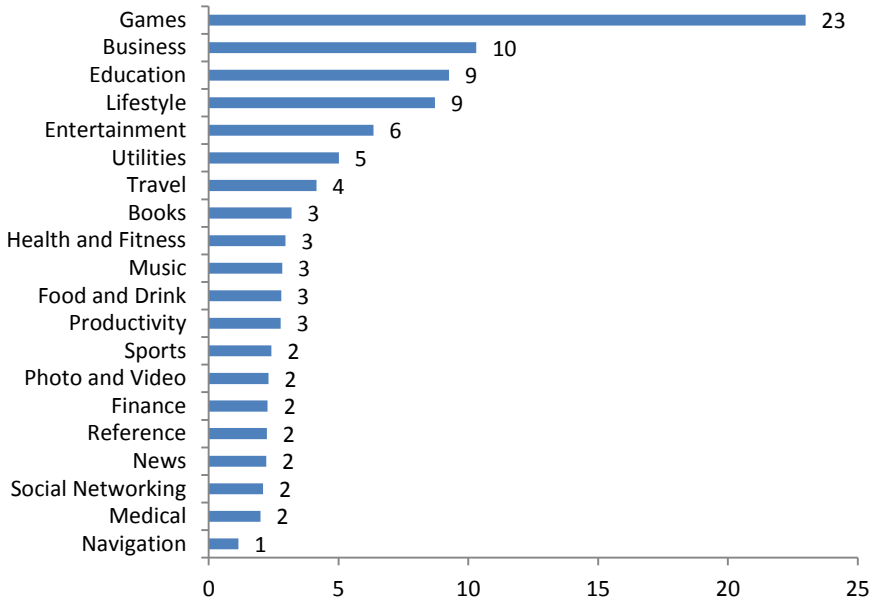


Source: Apple; Android; WindowsCentral.com; AppBrain; BlackBerry; Amazon as reported in Statista (http://www.statista.com/statistics/276623/number-of-apps-available-in-leading-app-stores/).

To distribute apps, developers have to pay $25 as a one-time registration fee in Google Play and $99 per year in the Apple app store. In both platforms, developers receive 70% of the application price less (local) taxes, while the remaining 30% goes to the app store as a payment for distribution and operation services. Both platforms apply restrictions on the type of apps that can be published. However, apps are subject to final approval by

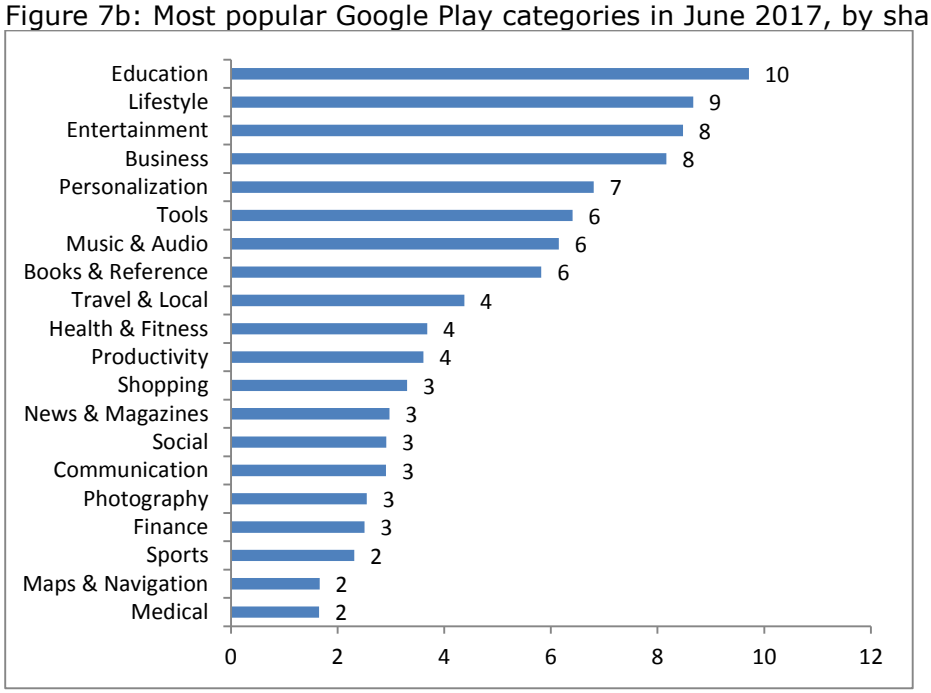
Apple after basic reliability testing and other analysis. Once approved, application developers can control which countries an app is distributed in, and also the pricing for the app and in-app purchases in each country. Apple only permits developers to sell apps at certain price points. There are around 90 price tiers, ranging from $0 (free) to $999.99 (or its equivalent in different currencies). Developers pick one tier, which applies to every country that their app is distributed in. Although some of these characteristics differ in alternative app stores – for instance in SlideMe, developers are able to retain up to 91% of the revenues generated by the app- these initiatives have been insufficient to attract critical mass.

Figure 6a: Most popular Apple App Store categories in March 2016, by share of available apps



Source: PocketGamer.biz as reported in Statista (http://www.statista.com/statistics/270291/popular-categories-in-the-app-store/).

Figure 7b: Most popular Google Play categories in June 2017, by share of available apps



Source: Appbrain (https://www.appbrain.com/stats/android-market-app-categories)

How app stores work depends on the nature of the apps being developed and consumed. Apps from established firms have much higher expected demand than apps from independent mobile entrepreneurs (Hyrynsalmi et al., 2016). These include established consumer-oriented online firms (Facebook, Google) and established consumer products and services firms (banks, airlines). These are mass market consumer firms, and with the exception of Google, mobile apps are a complement to their main business, a way to extend their customer connection into the mobile world. These firms tend to have many customers, and their customers tend to pick smartphones for reasons not particularly related to, e.g., their airline ticket app.

Unlike the web, the apps world is quite fragmented. First, users need to download the app they want to use. Once in the app, it is simply not possible to navigate to another app, and definitely not possible to use it if it has not been downloaded previously. To overcome this limitation, some players in the industry are developing the concept of app streaming. The concept is relatively new, but it could completely transform the way users engage with mobile content and services, with downloads no longer acting as barriers to discovery and access.

3.3 Social media

Social media applications, such as classic social networks (Facebook, LinkedIn), video sharing sites (YouTube), on-line dating communities (eHarmony, Match.com) represent a diverse and rapidly growing industry. In this industry, typically, multiple sites compete in a relatively well-defined category (video sharing, on-line dating)[29]. While these categories are quite different, social media sites share a number of important features. For instance, most of these sites rely extensively on user-generated content where consumers largely define the firms' product offerings. Typically, users have very heterogeneous content preferences and prefer sharing content with similar users, leading to large direct network externalities. In addition, it is easy for consumers to join multiple communities (multi-homing), and typically, sites compete with each other for consumer attention (time). Although information about time spent online is not abundant, Table 3 shows the proportion of individuals in the EU-28 that participate in different Internet activities. This table shows that social networks play an important role in online activities: in 2016 they were the second most popular activity, just behind search.

Table 3: Evolution of EU-28 individuals engaged in selected Internet activities

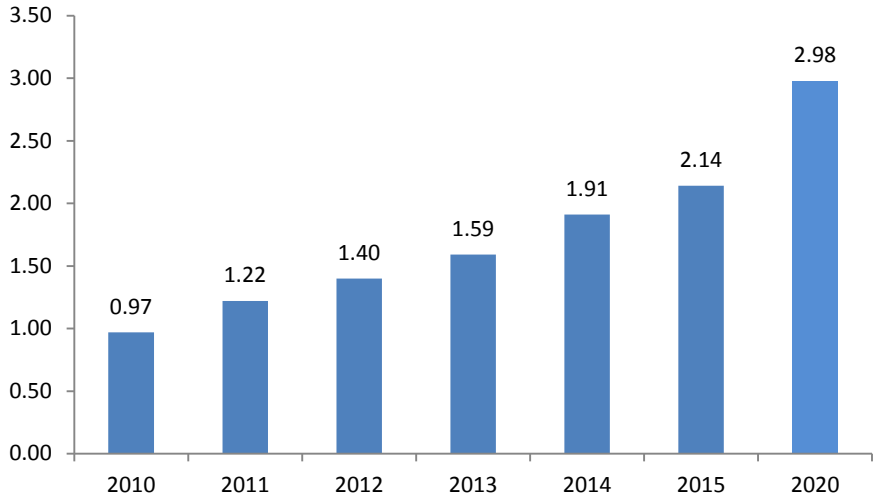
Activity	2007	2010	2013	2016
Online courses (of any subject)	3	4	6	6
Sending/receiving e-mails	48	61	67	71
Participating in social or professional networks	**n.a.**	**40**	**45**	**52**
Searching information about goods and services	46	56	59	66
Internet banking	25	36	42	49
Travel and accommodation services	31	37	38	40
Job search or sending an application	12	15	17	17

Note: the figures indicate the proportion of individuals aged 16-74 who declare they have been engaged in the activities listed above in the past 12 months.
Source: Eurostat.

[29] The Wikipedia entry *List of social networking* websites (accessed October 10, 2016) lists more than 200 online social networks, although as of today, some of them are already closed. See https://en.wikipedia.org/wiki/List_of_social_networking_websites.

Social networks have become increasingly popular for billions of people all over the world, who use them to stay in contact with family, friends or to find potential partners (Figure 7). Social networks share many characteristics with other online platforms. In this case, and in order to assess market structure, the intensity of competition and potential barriers to entry, it is important to know whether switching costs play a major role or not and also how easy it is for consumers to engage in multi-homing. To maintain or increase their penetration, social networks use several diversification strategies. They enable dense interactions with alternative online services, becoming the perfect example of networks of platforms. For instance, Facebook recently introduced e-commerce bots in its messenger function and also a classified market place, in order to enter the marketplace ecosystem. Similarly, due to data generated by its huge number of users, Facebook has been able to gain a strong position in the online advertising industry.

Figure 8: Social networks users worldwide (Billions)



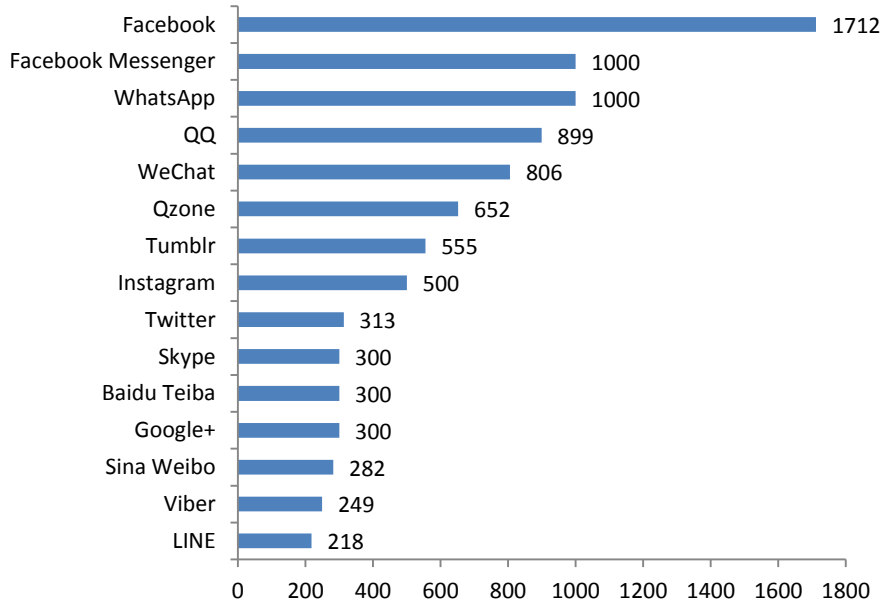
Note: Internet users who use a social network site via any device at least once per month.
Source: eMarketer.

In principle, multi-homing is possible, as it is relatively easy to set up a profile in many social sites. In this context, it is also interesting to note that well-known social networks can lose many active members over a very short time period, mostly due to the entry of a new platform, which appeals more to a sub-set of users of already-established networks. From a global perspective, Facebook is by far the leader (Figure 8). However, the number of relatively similar providers is rather high compared to other types of platforms[30]. One reason may be that social networks are still in the early stages of their diffusion curve compared to other online markets. In fact, social network platforms still show strong fluctuations in their market shares and (unique) visitor numbers.

There are at least two strong reasons for this. First, user preferences are more heterogeneous, and, second, it is not very costly for users to be present on two social networks, i.e., to engage in multi-homing. For example, one network may be used for social contacts while a second network may be used for business-related contacts and exchange. Given this complementarity, however, the degree of interaction between various business-related networks and various social networks may decline to some extent, as direct network effects are rather strong for social networks. The main value of the network lies in the number of members subscribed to the network. However, new networks can emerge, as multi-homing is rather easy and switching costs are not too substantial, even though many social networks have made efforts to increase switching costs by offering third-party log-in services. An interesting example was the entry of Google+ in 2011 (Facebook did so in 2004), which has attracted a significant number of unique visitors since then. However, even with significant financial strength (as part of one of the strongest companies in the IT sector), Google+ has still not got to the top 10 social networks 5 years after its creation.

[30] Although some mergers have been observed among the top ranked social networks sites (Facebook owns Instagram and WhatsApp), the list of social networking websites in Wikipedia (https://en.wikipedia.org/wiki/List_of_social_networking_websites) includes more than 200 different sites.

Figure 9: Top 15 social networks worldwide by active users, 2016 (Million)



Source: Statista.

Although the social media industry is still young, a few stylized facts seem to emerge. First, as a consequence of user-generated content, the content positioning of competing firms can be strongly influenced by their users. This suggests that user-generated content plays a key role in determining firms' market positions. This effect can be so strong, that sites with similar initial designs can acquire very different market positions. In another domain, a social media's appeal strongly depends on which type of users it attracts in the first place. Differentiation along this dimension is evident among the major dating sites, for instance. The market perception of a website is influenced by its user base even when the websites offer product features that explicitly appeal to a certain segment. Hence, 'user-generated content' may interact with product features and they jointly determine a site's market position.

While network externalities are clearly significant in all social media markets, different social media categories exhibit widely varying levels of concentrations. In some markets, we observe the emergence of a single, leading site (YouTube in the video-sharing industry, and Facebook in the social-networking industry) and a 'winner-takes-all' market structure develops, which is a typical market outcome in traditional network industries. In other markets, competing firms are able to coexist with differentiated positions despite strong network externalities.

An important aspect of many social media companies is that they can also be used by small business owners and independent professionals to market their products. Unfortunately, many small business owners continue to be disadvantaged because of their lack of knowledge and experience in how to use social media to grow business profits. Often, small business owners simply do not have the technical background to understand how to use social media. In order to overcome this, social media platforms have developed specialised tools to help potential users to learn how to better use their outlets. For instance, Youtube introduced the Youtube Academy, basically a catalogue of tutorials to help potential users to shoot and edit videos. Examples of this trend are the professional use of Youtube or Twitter accounts, or the increasing use of Facebook as a platform for publishers where users share and read/watch more and more articles, videos, etc. This transition from user-generated content to professional-generated

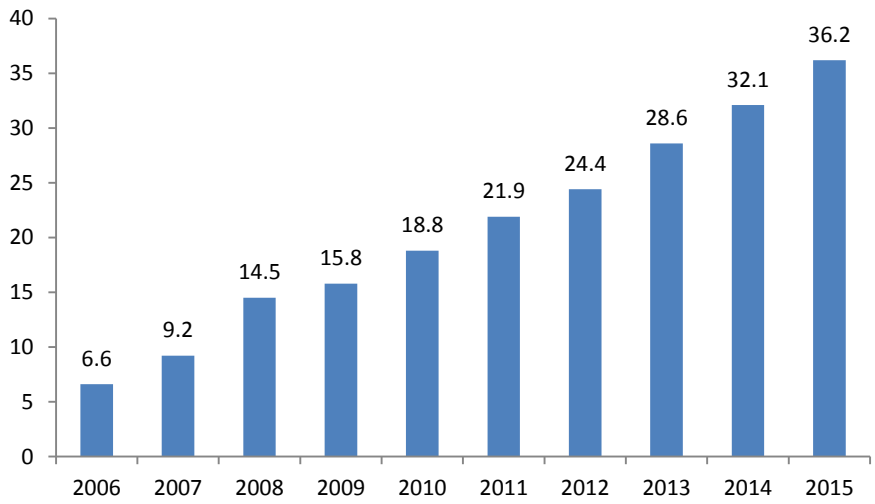
content is developing fast and could eventually re-shape social media platforms completely in the future[31].

3.4 Online advertising

Online advertising began in 1994 when HotWire sold the first banner ads to several advertisers[32]. Revenue grew very rapidly until 2001, when the dot-com bust weakened many of the early online advertising industry players and reduced the demand for online advertising. The industry regained momentum in 2004 as the business model for "Web 2.0" came together. A number of businesses such as Advertising.com, Google and ValueClick emerged that facilitated the buying and selling of advertising space on web pages. Many websites settled on the traditional free model: i.e. generate traffic by giving away the content and sell that traffic to advertisers. In the EU, the volume of online advertising has been growing steadily over the last few years, reaching €36.2 Billion in 2015 (Figure 9). It has overtaken TV to become the largest advertising medium in Europe (Figure 10). Moreover, the portion of advertising that is done online is expected to increase significantly over time as web-based content and services expand and people are able to access the web through more devices such as mobile telephones and televisions (Figure 11).

The online advertising industry concerns buying and selling advertising space that is accessed by viewers through the Internet. Industry observers often divide the online advertising industry into: (1) "search advertising" that appears on search results pages; (2) "display advertising" that appears on non-search web pages; (3) classified listings that appear on websites; and (4) Internet e-mail based advertisements. Search-based advertising accounts for the largest portion followed by display-related advertising. All segments have grown significantly in the last few years though search has grown the most (Table 4).

Figure 10: Internet advertising expenditure in the EU-28 (Billion €)

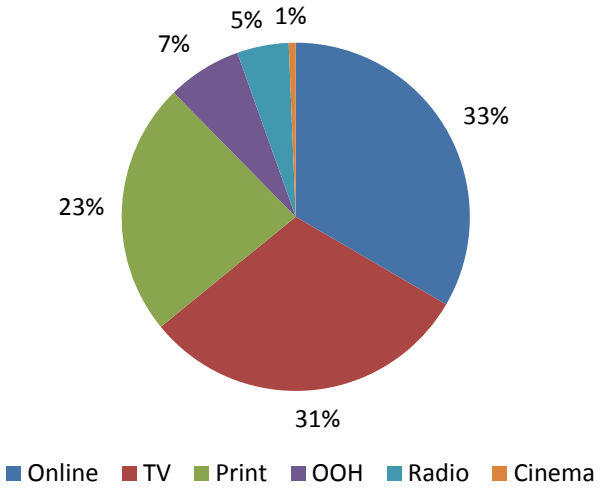


Source: IAB Europe.

[31] I am grateful to many colleagues in DG CNECT who commented on a previous version of this paper for pointing this out. Many of the examples used are theirs. This is definitely an issue that will be closely monitored by the JRC.

[32] Some other stories can be found in the literature.

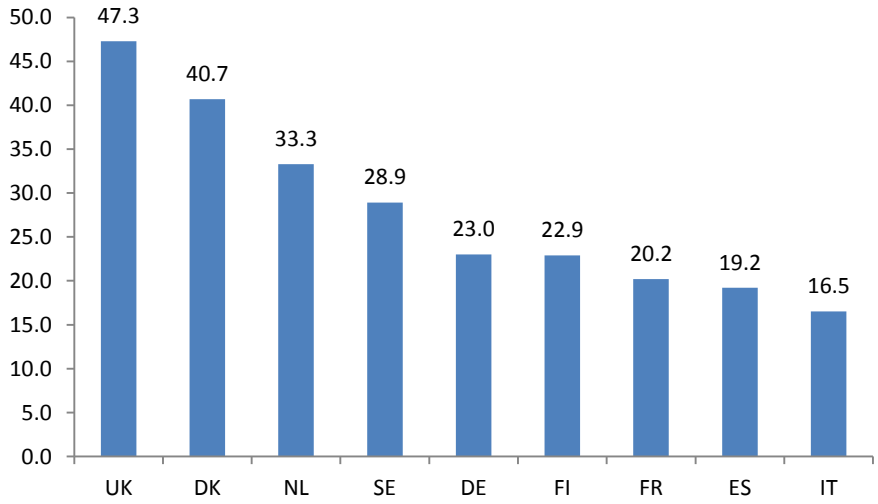
Figure 11: Online advertising expenditure by category in 2015, EU-28 (%)



Source: IAB Europe.

In many ways, on-line advertising is similar to traditional advertising, although recently it has become quite sophisticated. Publishers use content to attract viewers and then sell advertisers access to those viewers. Advertisers can display text (like classifieds), graphics (like magazines) and video (like television) ads in the space supplied by the publishers. On one level, one can think of the web as just adding more advertising inventory, much like displaying ads on televisions in the back of taxis. Indeed, in some ways the introduction of online advertising was a less radical innovation than the introduction of other media. After all, television enabled advertisers to reach mass audiences with video ads while the web, until recently, relied on quite traditional methods of presentation.

Figure 12: Share of online advertising in selected EU countries, 2014



Source: Statista.

Table 4: Online advertising expenditure by format in 2015, EU-28

Format	Bn€	%
Display	13.8	38.3
Classifieds & Directories	5.3	14.7
Paid-for-search	16.9	46.9
Total	36.2	100.0

Source: IAB Europe.

Three radical innovations, however, distinguish online from offline advertising. The first has transformed the service obtained by the advertiser: the Internet provides a highly efficient mechanism for delivering ads to individual users and collecting information for targeting ads to those users. The second has transformed the process of buying and selling advertising space: the Internet has enabled the development of more efficient intermediation markets for advertising —the keyword bidding system used for search and contextual advertising is the most mature example. The third is leading to economies of specialization: traditional publishers provide content for attracting viewers and sell advertising space to advertisers; online publishers are increasingly turning the selling of advertising space over specialized advertising platforms such as Google or advertising.com. As more advertising moves to Internet-connected devices, these innovations will dramatically alter the advertising ecosystem. These innovations are mainly affecting search and display advertising.

Real-time bidding (RTB), also known as programmatic buying, has recently become the fastest growing area in online advertising. Instead of bulk buying and inventory-centric buying, RTB mimics stock exchanges and utilises computer algorithms to automatically buy and sell ads in real-time ('platforms-of-platforms' type services are even offered whereby prices on different RTB marketplaces and quotes provided by marketing agencies are arbitraged). Its functioning is based on a per-impression framework and targets the ads to specific people based on data about them, and hence dramatically increases the effectiveness of display advertising.

The current structure of the industry revolves around the concept of Ad Exchanges, i.e., technology platforms that facilitate the buying and selling of media ad inventory from multiple sources by means of RTB auctions. These platforms aim to show an ad to the right audience at the right time. Publishers (mostly websites), offer ad space for sale, which is normally managed and aggregated by supply-side platforms (SSP). These enable publishers to manage their advertising space inventory, fill it with ads and get revenue. They serve as interfaces between publishers and ad exchanges. On the advertiser side, demand-side platforms allow buyers of digital ad inventory to manage multiple ad exchange accounts through just one interface. Even though several platforms are present in the different stages of this process, there is a high level of concentration, particularly on the supply side (Table 5). Moreover, as the table shows, some of these agents are either vertically integrated or participate in different stages of the process, which raises concerns regarding entry barriers and UTPs. In this respect, according to a recent report, lack of transparency with partners is one of the most frequent issues with programmatic ads (according to US publishers)[33].

[33] See: https://www.emarketer.com/Chart/Issues-with-Programmatic-Advertising-According-US-Publishers-Oct-2016-of-respondents/203069

Table 5: Market share of different participants in the online advertising space, 2015

Demand Side Platforms	%	Ad Exchanges	%	Supply Side platforms	%
MediaMath	39.3	DoubleClick.Net	30.3	AppNexus	68.8
RocketFuel	14.1	AppNexus	16.3	Rubicon Project	27.2
The Trade Desk	13.5	Advertising.com	11.8	PubMatic	3.5
Simpli.fi	8.6	Rubicon Project	12.7	Zedo	0.3
DataXu	6.8	Openads/OpenX	11.2	YieldLab	0.1
Turn	5.5	Pubmatic	10.7	StackAdapt	0.0
Yahoo Ad Manager Plus	2.5	Yahoo Ad Sync	4.4	Pubfood.js	0.0
SiteScout	2.4	Facebook Exchange FBX	1.7	Sonobi	0.0
Alephd	1.8	Nexage	0.3		
Connexity	1.8	Connatix	0.5		
33Across	1.5				
RadiumOne	0.9				
FreakOut	0.7				
Tradelab	0.3				
Others (9 platforms)	0.3				
Total	**100.0**	**Total**	**100.0**	**Total**	**100.0**

Source: Market share for demand- and supply-side platforms comes from Datanyze (https://www.datanyze.com/). The percentages shown represent the number of websites using a given technology, divided by the total number of websites using any of the technologies selected; websites limited to the Alexa Top 1 Million. Data for Ad Exchanges is from BuiltWith (https://builtwith.com/), a company that tracks online advertising technologies via the banner signatures embedded into the top 10,000 websites. Shares may change if the reference number of websites changes.

In particular, there is the potential threat that powerful Internet players –such as Google and Facebook- could extend their traffic leadership into the online advertising environment. It seems natural to expect that those websites/platforms that attract the most internet traffic are also in the best position to monetise the attention they generate through ads. Although there are very few data available on the revenue shares of the online advertising market, and almost none at the European level, there are some figures at the world level. Table 6 shows that the top 6 companies in terms of ad revenue worldwide take more than 50% of online ad revenue, leaving the rest to all the other online publishers.

Table 6: Net Digital Ad Revenue Worldwide, by company (in %)

Company	2015	2016
Google	33.3	30.9
Facebook	10.7	12.0
Alibaba	5.1	5.9
Yahoo	2.1	1.5
Microsoft	1.6	1.6
Twitter	1.3	1.4
Others	46.0	46.8
Total (Bn US dollars)	159.33	186.81

Note: Includes advertising that appears on desktops, laptops, tablets, mobile phones and other connected devices. Figures include all advertising formats. Net revenues are calculated by deducting traffic acquisition costs (TAC).
Source: eMarketer[34]

Google has recently become the largest operator in the Ad Exchange segment, through its subsidiary. It also operates a leading demand-side platform called DoubleClick Bid Manager. Pressures on ad buyers to use the two components together have raised questions about fairness since Google can use AdX to limit competition within the DSP market. Similarly, parallel worries have arisen about the increasing presence of Facebook on the online ad ecosystem. By leveraging the data collected from its more than 1.5 billion users, Facebook has been able to gain positions in the whole value chain. Although some companies like Twitter or Snapchat are trying to compete, they are still fringe players.

Historically, most advertisers and publishers began their programmatic trading in open, real-time auctions. However, programmatic direct trades are growing in popularity and are expected to attract a significant volume of outlays in the coming years. Ads on social sites such as Facebook and Twitter—which are chiefly programmatic direct buys—will make up the bulk of spending in this category, and will reinforce the already strong positions of many of these websites[35].

Advertisers may on occasion choose one medium over all others. However, often an advertiser will find it beneficial to select multiple media (multi-home). This allows the advertiser to target a broader group of consumers and to utilize their chosen advertising budget optimally. We can expect to see substitution among advertising media as the costs and benefits of each of the media vary over time and as the advertising budget responds to the effectiveness of the advertising programme (the more effective the programme, the larger the advertising budget).

An advertiser that wishes to get a high degree of penetration into a market from its ads would need to advertise through many different vehicles and media in order to reach a high percentage of the public with at least one of them. It is quite possible, therefore, that the return per euro of expenditure on a single advertising medium may be large up to a point (i.e., for sufficiently small advertising expenditures). However, for sufficiently large expenditures in that medium, the return on additional expenditures may fall, even to the point of unprofitability. Decreasing returns on advertising on a single medium can occur, in particular, when the level of advertising approaches saturation of that medium. Decreasing returns can also arise because ads may become less effective as the number of exposures ("frequency") increases. Users may tire of a particular ad and stop noticing it ("ad blindness"), and so on. Furthermore, the return to advertising can decline even if

[34] http://www.emarketer.com/Chart/Net-Digital-Ad-Revenue-Share-Worldwide-by-Company-2015-2016-of-total-billions/194220
[35] https://www.emarketer.com/Report/Programmatic-Advertising-Germany-Efficiencies-of-Automation-Begin-Persuade-Brands-Agencies-Publishers/2001866#sthash.seHCzHn6.dpuf

the effectiveness of the advertising itself does not—if the profit per conversion declines. This may occur, for example, if the advertiser faces increasing marginal costs or capacity constraints.

Conclusions

The indirect network effects between user groups served by a single online platform are strong in many important industries. Already present in many traditional economic activities, multi-sided platforms have flourished in the digital economy. The economics of multi-sided platforms provides insights into how these businesses and industries behave that are relevant for areas of competition analysis, such as market definition, coordinated practices, unilateral practices, and the evaluation of efficiencies. They also help us to assess the potential negative effect of perceived unfair commercial trading practices that platforms may engage in as a result of imbalances in bargaining power[36]. Today, the economic literature provides insights that can assist in this analysis. However, there is a lack of empirical evidence to support many of the issues raised by the theory. Moreover, the theory of multi-sided markets has up until now looked at platforms as though they are the traditional black-box in microeconomics, i.e., as a passive actor that merely sets prices and provides a centralised marketplace for matching users. Platforms acting as economic agents are able to manipulate other strategic instruments in order to select their user base, and consolidate their position in the market.

[36] COM(2016) 288 final, Online Platforms and the Digital Single Market Opportunities and Challenges for Europe.

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Annex

Table 7: Share of Top 25 online retailers in the EU-28, 2015

Company	Brand	Share
Amazon.com Inc	3rd Party Merchants	10.8
Amazon.com Inc	Amazon	9.1
ebay Inc	3rd Party Merchants	6.8
Tesco Plc	Tesco	2.6
ebay Inc	ebay	2.0
Apple Inc	App Store	1.7
Next Plc	Next Directory	1.1
E Leclerc	Leclerc	1.1
Naspers Ltd	Allegro	1.0
Zalando GmBH	Zalando	1.0
Otto Group	Otto	0.9
Dixons Carphone Plc	Currys	0.9
John Lewis Partnership Plc	John Lewis	0.9
J Sainsbury Plc	Sainsbury's	0.9
Venteprivee.com SAS	3rd Party Merchants	0.8
Apple Inc	itunes	0.8
Casino GuichardPerrachon SA	Cdiscount	0.8
Ocado Group Plc	Ocado	0.8
WalMart Stores Inc	Asda	0.7
Shop Direct Group Ltd	Littlewoods	0.6
Dell Inc	Dell	0.6
Asos Plc	Asos	0.5
Shop Direct Group Ltd	Very	0.5
Casino GuichardPerrachon SA	3rd Party Merchants	0.5
Marks & Spencer Plc	Marks & Spencer	0.5

Note: the purpose of the table is to show the place of EM within the whole EU-28 retail sector. Some of the companies listed in the table operate in a single MS. However, its share in the whole EU-28 market is relevant.
Source: Euromonitor.

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