

Ecosystems and competition law in theory and practice

Michael G Jacobides, London Business School

Ioannis Lianos, Hellenic Competition Commission & UCL

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Abstract

One of the most profound changes in the industrial landscape in the last decade has been the growth of business ecosystems- groups of connected firms, drawing on (digital) platforms which leverage their complementors and lock-in their customers, exploiting the “bottlenecks” that emerge in new industry architectures. This have created new asymmetries of power, where the “field” of competition is not the relevant product market, as is usually the case in competition law, but rather the ecosystem of various complementary products and associated complementor firms. These dynamics raise novel concerns over competition. After examining the foundational elements of the ecosystem concept, we review how ecosystems are addressed within the current scope of competition law, and identify the gap in the existing framework of conventional competition law. We then move to a critical review of current efforts and proposals in the EU for providing regulatory remedies for *ex ante* and *ex post* resolution of problems, focusing on the current (2020) proposals of the Digital Market Act on *ex ante* regulation, with its particular focus on “gatekeepers.” We also review recent regulatory initiatives in European countries that focus on *ex post* regulation, and on the role of business models and ecosystem architectures in regulation, before providing a deep dive into proposed Greek legislation that explicitly focuses on ecosystem regulation. We conclude with our observations on the challenges in instituting and implementing a regulatory framework for ecosystems, drawing not research and our own engagement in the regulatory process.

(244 words)

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1. Introduction

During the 2010s, the top five firms in terms of market capitalization shifted from giants of industry and finance to technology-based firms such as GAFAM (Google, Apple, Facebook, Amazon, and Microsoft). At first, GAFAM's meteoric rise to power drew great admiration, and significant attention was paid to the platforms that underpin these firms' success (Cusumano & Gawer, 2012; Parker & van Alstyne, 2016; Cusumano, Gawer, & Yoffie, 2019). Interest in GAFAM's ecosystems—that is, the groups of co-specialized firms that they depend on—primarily focused on the strategies that underpin them (Iansiti & Levien, 2004; Ander, 2013, 2017; Jacobides et al, 2018; Jacobides, 2019b; Iansiti & Lakhani, 2020).

Yet this power also raises questions. Today's corporate giants sit at the center of powerful *multi-product* webs that drive customer lock-in (Stigler, 2019)—for example, a mobile device, its operating system, apps, services, and so on. This poses significant new challenges for competition policy, since the “field” of competition is not a single product market, but an ecosystem of complementary products. Today's giants also orchestrate *multi-actor* ecosystems that allow them to leverage their complementors (Hagiu & Wright, 2020), often around core (digital) platforms (Pon et al, 2014). The economics of new, fast-growing digital markets are often characterized by network externalities or low variable/high fixed costs, making them prone to tipping and lock-in for customers and complementors. Ecosystem orchestrators wield power by being nodal and hard to replace (Cusumano, Gawer, & Yoffie, 2019; Iansiti & Lakhani, 2017; 2020), and exploit the “bottlenecks” that emerge in these new industry architectures (Baldwin, 2014; Jacobides et al, 2006). They are driven by the prospect of ultimate client lock-in, funded by the capital markets, and difficult to pin down to any one market (Khan, 2017; Dolmans & Pesch, 2019). Worryingly, our existing regulatory apparatus is ill-equipped to tackle, or even identify, the issues that they raise.

Some voices have been raised against these dominant actors. Reports published in 2019 in the UK (Furman Report, 2019), the EU (Cremer et al, 2019), the US (Stigler Report, 2019), and BRICS (Lianos, Ivanov et al, 2019) all point to the need for new analytical tools—yet it is only recently that the ecosystem concept itself has been clearly delineated. At the same

time, pressure is mounting in multiple regions around the world to provide a rational, pro-innovation regulatory framework that can tame dominant actors.

2. Understanding ecosystems: Framing observations

The concept of ecosystems has gained significant traction as a distinct organizational form. In a BCG study, the use of the term “ecosystem” in major US firms’ annual reports grew 13-fold from 2008 to 2017 (Fuller et al, 2019). Yet, the term’s exact meaning remains unclear, even in the management literature (Iansiti & Levien, 2004; Moore, 1993; Teece, 2007). The concept reflects the emergence of business environments marked by modularity in production, co-evolution, and decisional complexity, where innovation must be coordinated across different hierarchies, markets, and industries (Baldwin & Clark, 2000). Despite these real-world correlates, however, the term was originally used more as a metaphor (Moore, 2006). More recently, Adner (2017) and Jacobides et al (2018) have aimed to systematize our understanding of ecosystems. The authors regard ecosystems as communities of collaborating firms that collectively produce a good, service, or solution, that co-evolve their products under an aligned vision (Moore, 2006), and that “must deal with either unique or supermodular complementarities that are non-generic, requiring the creation of a specific structure of relationships and alignment to create value” (Jacobides et al, 2018).²

Most strategy literature considers that ecosystems are often based on platforms, which enable the connections between ecosystem actors and possibly end users. Platforms and ecosystems are not the same, though, and should not be conflated. A platform may be defined as a new business model, a new social technology, a new infrastructural formation, or all three at once (Cohen, 2017). Platforms provide the foundation for the web of interactions that define ecosystems; if platforms are about technologies, ecosystems are

² This focus stands in stark contrast with the looser uses of the term to cover types of interactions found in, for instance, industrial districts and clusters (e.g. Beccatini, 2002). Additional reviews have been offered by Kapoor (2018), Bogers, Sims, and West (2019), and Baldwin (2020), discussing how ecosystem research relates to other streams in strategy and innovation.

about inter-organizational relations (Jacobides et al, 2020b). Ecosystems, which often draw on platforms, arise not from centralized control, but from the interactions between the components of a correlated system (A.F. Siegenfeld & Bar-Yam, 2020). Ecosystems refer to *multi-actor* groups of collaborating complementors, (i.e., “theory of the firm” alternatives to vertical integration or supply-chain arrangements), and *multi-product* bundles offered to customers (i.e., horizontally or diagonally connected goods and services that are “packaged” together).

Ecosystems often compete with each other, as the Apple and Android (Google) smartphone ecosystems illustrate. Such *inter-ecosystem competition* emphasizes substitutability (Crane, 2019), mostly between multi-product ecosystems. However, since ecosystems also rest on interactions between independent firms, multi-actor ecosystems also give rise to *horizontal intra-ecosystem competition* (between firms offering rivalrous, potentially substitute offerings within the same ecosystem) (Bourreau, 2020), and *vertical intra-ecosystem competition*, which refers to value captured through joint collaboration (between ecosystem participants, including the orchestrator)³. Vertical intra-ecosystem competition falls in a blind spot of existing competition law (Lianos, 2019b).

Ecosystems may become sources of significant distributed innovation and creativity through economies of scale and specialization (Grundlach, 2006). However, non-generic complementarities could also enable dominant actors in ecosystems to exploit locked-in complementors or final consumers.⁴ Competitive analysis of such contexts is delicate, as it

³ For a discussion of the concept of ‘vertical competition’ see Steiner (2008) who coined the term in order to describe competition for surplus between distributors and suppliers in traditional vertical relations. The concept can also be broadened to encompass competition between the members of an ecosystem for a higher percentage of the surplus value generated by the ecosystem as in Lianos et al. (2019).

⁴ Jacobides et al (2018) argue that ecosystems rely on complementarities between independent actors who are not hierarchically fully controlled. These complementarities may be unique (i.e., you need components A and B in fixed proportions) or supermodular (the value of A increases in the presence of B, which is what is usually associated with network externalities). Ecosystems, narrowly defined, rely on *non-generic complementarities*, which means that some extent of customization is needed to participate in them. Participating in an ecosystem may require using its interfaces and protocols, meaning that complementors are tied into it inasmuch as part of their work or investment only works within that ecosystem. The more customized these interfaces and protocols are, the more an orchestrator can abuse their position of strength. While unique complementarities are not new to competition law (issues of power along value chains have been addressed, e.g., by Lianos & Carballa Schmischowski (2020), supermodular complementarities (which

is hard to assess the true prices involved—a common challenge for Multi-Sided Platforms (MSPs), which underpin many ecosystems. MSPs link ecosystem participants such as advertisers and website visitors, where a zero-price good for the final consumer (such as free storage or email) is subsidized by ad revenue. Thus, while final customers may be happy with the “free” product, orchestrators may intrude on them in non-monetary ways (through advertising), and may be squeezing their complementors too (Jacobides et al, 2020b: 13).

Ecosystem orchestrators make strategic use of their APIs (Application Programming Interfaces, which enable external apps to connect), algorithms based on Big Data analytics, or contractual restrictions to ensure interconnectivity and interoperability for final consumers. However, the same means also provide them with profitable points of control and the resources to build a strategic competitive advantage, or at least obtain strategically and commercially valuable information⁵. For instance, Facebook and Google allow complementors to connect to their platforms, but also use these connections to obtain valuable information on user preferences and activities in real time, which gives them the ability to profile customers and sell hyper-targeted advertising services.

Several key challenges arise when a platform acts as an intermediary. First, its owner can better understand the willingness-to-pay of the various sides of their market through data harvesting and personalization, thus extracting a higher surplus for their “matching.” Second, they can serve as hubs for collusive activity across their ecosystem to set prices or

underpin network externalities) are harder to tackle. On the related network externalities issue, see Economides (1996).

⁵ This was one of the theories of harm examined in the (ultimately approved) Apple/Shazam merger, in which the Commission considered whether the new corporate entity would have gained access to commercially sensitive information regarding the upstream or downstream activities of its rivals. This was particularly pertinent in view of the fact that Shazam currently collects certain data on users of third-party apps, and in particular digital music streaming apps, installed on the same smart mobile devices as the Shazam app (for both Android and iOS), and allows those of its users who are also users of Spotify to connect their Shazam account (anonymous or registered) to their Spotify account (freemium or premium). Shazam could have therefore gained access to some additional information on Spotify users, in particular Spotify premium users. It was in this context that the Commission assessed “whether, through the acquisition of control over the Shazam app and Shazam’s database, Apple could gain access to certain data on its competitors, and in particular on Spotify, in the markets for digital music streaming apps [...] and whether this could lead to any non- horizontal non-coordinated anti-competitive effects.” *Apple/ Shazam* (Case M.8788) Commission Decision (11 November 2018), available at http://ec.europa.eu/competition/mergers/cases/decisions/m8788_1279_3.pdf, para. 200.

“fix” other important parameters of competition. Third, they can increase users’ willingness-to-pay for the platform itself by adding new functionality, and inducing complementors to develop products that increase the value of the platform. Fourth, they can extract more surplus value from their ecosystem—for instance, by capturing “value as a portion of the sale of every complementary product or service sold for the platform” (Cusumano et al, 2019: 79)—or, more simply, by selling information on users to advertisers. Finally, the fact that capital markets recognize this power creates a vicious circle, since ecosystem dominance begets market valuation and capital flows, which beget funds, which beget even greater power (see Teng & Jacobides, 2021, for a discussion on Grab in Southeast Asia).

These issues are particularly salient in the case of *gatekeepers*, who dominate ecosystems due to “architectural concentration” (Moore, 2006; Jacobides, 2020b) when platforms provide irreplaceable access to consumers. This power is even greater if users cannot easily multi-home (use multiple platforms in parallel) or switch between rival offerings. Since gatekeepers are deemed to be powerful, they may need to be held to a higher standard—especially if complementors are also more readily substitutable, and must multi-home across platforms. This becomes all the more salient when ecosystem orchestrators can turn themselves into a “default” for customers, making them difficult to dislodge.⁶

Although these dynamics are now increasingly understood by the economic and business literature, regulatory authorities still find it hard to engage with the reality—partly due to confusion over concepts and terms. To clarify the picture, we propose a specific nomenclature, shown in Table 1. Then, drawing on those definitions, we consider the “gap” in current regulation.

⁶ Even established players of significant size, such as Tinder, will find it difficult to resist gatekeepers such as Apple, who mediate the relationship between customers and their services. Apple users, willingly confined inside its walled garden, are unlikely to use an Android phone; complementors are easy to substitute; and network effects make users more likely to stay within Apple’s (multi-product) ecosystem. So Tinder has to accept the terms offered, or risk decimating its appeal by cutting off Apple users—which would detract from its own network desirability.

Table 1: Key constructs, what they cover—and what they don’t

Platforms	Platforms provide the technical and institutional infrastructure for enabling the collaboration of different entities. Some, such as Multi-Sided Platforms or Multi-Sided Markets, help to coordinate many different entities or link various categories of users. Platforms are often digital, but not exclusively.
Platform Orchestrators	Platforms are often (but not always) owned or controlled by a single entity, which tends to be a commercial undertaking with an active interest in building an ecosystem. However, there are a few platforms that are not controlled or owned by one entity, but by an alternative governance mechanism (e.g., Linux has a foundation; Android is a separate entity indirectly controlled by Google that uses “Google Mobile Services,” a complementary platform orchestrated formally by Google.)
Core Platform Services (EU’s DMA proposals)	A term popularized by the Commission’s Digital Markets Act (DMA), which covers services offered by particular platforms, such as: (i) online intermediation services (including, for example, marketplaces, app stores, and online intermediation services in other sectors like mobility, transport or energy); (ii) online search engines; (iii) social networking; (iv) video sharing platform services; (v) number-independent interpersonal electronic communication services; (vi) operating systems; (vii) cloud services; and (viii) advertising services, including advertising networks, advertising exchanges, and any other advertising intermediation services, where these advertising services are being related to one or more of the other core platform services mentioned above. These are all digital platforms, although the Commission also mentions that there may be non-digital core platform services, but these are not covered by the DMA.
Ecosystems (multi-actor)	Multi-actor ecosystems are groups of independent actors that collaborate through non-generic complementarities for the provision of a collectively produced product or service or bundle of products and services.
Ecosystems (multi-product)	Multi-product ecosystems are groups of complementary goods and services that form a bundle that can be consumed by the final customer, which collectively can create consumer lock-in—which, in turn, can bring benefits to the orchestrators of those ecosystems with regard to both customers and complementors.
Ecosystem orchestrators	Ecosystem orchestrators are entities that guide multi-product or multi-actor ecosystems. They decide the rules of engagement: who does what, the conditions of participation, and governance. Orchestrators tend to own platforms, but do not necessarily do so. Their orchestration may be either deliberative or directed.

Dominant actors in ecosystems	A dominant actor sits at the center of an ecosystem and can act independently of its competitors in the same ecosystem, its customers, and ultimately of its users. Not all orchestrators become dominant actors in their ecosystems (consider non-hierarchical governance in blockchain ecosystems, with technology providing the governance blueprints).
Ecosystem power sources	The power of orchestrators/dominant actors rests on the fact that they (i) control a bottleneck, which can be enhanced by customer lock-in (bottleneck power), or (ii) have a positional power that enables them to harvest information about their competitors (panopticon power), or (iii) can harvest information about consumers and therefore drive the consumers' agenda and as such shape their behavior or otherwise take advantage of it (through customization, advertising, etc) (intermediation power).
Gatekeepers	Gatekeepers <i>de facto</i> are orchestrators of platforms (or ecosystems) with particular impact, in terms of quasi-irreplaceable access to consumers, and that potentially impose obstacles on user multi-homing or switching platforms (or ecosystems) ⁷ Complementor substitutability, network effects, and established scale make these potentially powerful. According to the DMA (Article 3), gatekeepers are entities that (i) have a significant impact on the EU internal market, (ii) operate one or more important gateways to customers, and (iii) enjoy or are expected to enjoy an entrenched and durable position in their operations. The DMA definition is intended to apply to a particular dominant actor, where economic significance, scope, or size provide pragmatic grounds for concern about control over a significant part of the economy, and where the ecosystem in question is global rather than local or regional.

3. Identifying the Regulatory Gap

Competition law enforcement usually focuses on the anticompetitive impact of some conduct on a specific “relevant market(s).” The boundaries of the relevant market depend on the existence of cross-price elasticities of demand and supply, and the degree to which two products may be substitutable for each other. The concept of relevant market identifies the field of competitive interactions to be assessed (i.e., the market), delimits the problem that competition law aims to correct (e.g., output restrictions increasing producer surplus and reducing consumer surplus, or wealth transfers from consumers to producers affecting consumers in the specific relevant market), and intrinsically relates to the policy goal(s) of competition law, which focus on consumer welfare (Werden, 1992) and also include

⁷ Note that the DMA does not specify that Gatekeepers orchestrate ecosystems.

innovation. However, with the emergence of multi-product and multi-actor ecosystems, and platforms that span multiple economic activities, this concept is no longer adequate to reflect the new reality.

First, the “relevant market” framework does not fully take related markets into account—for example, if a firm leverages its market power from one relevant market in another. As previous scholars have noted, “families” of closely related products creating systems competition (Katz & Shapiro, 1994) increase the costs imposed on new entrants, who must create a competing family or co-operate with existing complementors. However, a dominant actor might retaliate by making its core product incompatible with its rivals’, thus “undermining attempts to establish substitute ecosystems based on more advanced technology” (Moore, 2006). The dominant actor may also seek to subsidize complementors on condition of exclusivity, or subsidize its own divisions that sell complementary goods, thus leading to overcharges for final consumers through a softening of competition. The total market value of the dominant actor can thus increase, while its competitive position is strengthened by the hurdles placed in its rivals’ path.

An analogous issue has been raised in cases where a manufacturer has prevented independent third parties from servicing its equipment, or from selling replacement parts. The classic example is a manufacturer selling printers at cost (or even below it), and charging high mark-ups on proprietary ink cartridges. This type of “non-structural” market power locks consumers in with sunk costs, switching costs, and information asymmetry—as they rarely consider, when purchasing the primary product, the possibility that they might be exploited in the provision of service or parts. To the extent that these practices affect consumers purchasing both the core product and the complements, it is possible to identify their effects on competition and the harm done to consumers. According to case law, there is a requirement for associative links between the various relevant markets even if they are not vertically related—however, this is usually defined quite broadly⁸. When we are concerned with the welfare effects on the same final consumers, the competition

⁸ See, in particular, Case T- 83/ 91, *Tetra Pak International SA v Commission*, ECLI:EU:T:1994:246; Case C-333/94 P, *Tetra Pak International SA v Commission*, ECLI:EU:C:1996:436, paras 21–3.

problem is usually simple enough to be solved with the traditional relevant market framework in competition law.

Second, the concept of “relevant market” faces significant challenges in the context of industry or transaction platforms, which increase complexity. Here, the (market) value of the platform increases with each additional user (Cusumano et al, 2019), and product quality is less important than the value provided by the overall platform or ecosystem to different *categories* of users. Take, for instance, the case of a multi-sided advert-based platform such as Google, which sells space to advertisers while providing free internet search to consumers. This setup may be analyzed as a form of requirement contract bundling digital services with personal data (Economides & Lianos, 2019). It reinforces the positive feedback loop between search and the data inferences Google sells to advertisers: free search boosts demand for ads sold by Google, driving up the price of ads. Note, however, that search and ads are *complementary services* sold in different relevant markets—and if we focus only on *one* market, we will miss what is driving dynamics overall.

If we analyze such practices under the traditional “relevant market” framework, which emphasizes consumer welfare, we face the complication that the end user in one market becomes the productive input in the other. Take, for instance, Google, which offers services to final users (search for free), advertisers (predictions about users’ preferences), and various content providers (users’ attention). One option is to analyze anticompetitive price effects on the advertising side while taking into account the demand shift created in the market for search, following the traditional relevant market approach. Alternatively, we can define “attention markets” (Evans, 2020; Newman, 2019) on the search side, and focus on the exploitative effects on some other parameter of competition valued by the end users (e.g. privacy). “Attention intermediaries” would then operate as multi-sided platforms providing various forms of intermediation services to different categories of users (app developers, sellers, advertisers, and final consumers) (Peitz, 2020). The competitive situation can be assessed from the perspective of a specific category of users with the relevant market framework. However, if the effect is different on each side of the platform, any aggregation as to the total consumer welfare effect would have to compare the welfare

of different categories of users, and make difficult choices as to whether and how the net effect would be calculated. A competition analysis focusing on consumer welfare will therefore need to either (i) decide which relevant market will serve as the main unit of analysis, or (ii) balance costs and benefits for the different categories of consumers affected in *all* relevant markets.

The challenge for competition law is to escape a narrow emphasis on price in terms of final goods as a measure of market power, which neglects too much of the real action, and the sole consideration of the relevant market framework. We need to adjust our regulatory framework, lest it become perilously distant from the reality of real-world power (Siegenfeld & Bar-Yam, 2020). The challenge is that the standard “relevant market” approach explicitly focuses on the average behavior in one of the system’s components (i.e., firms producing neatly separable, substitutable products) and the deviations of individual components from this average (e.g. higher prices, lower quality, and reduced innovation), but fails to appreciate the dynamics of multi-product and multi-actor ecosystems.

Table 2 below provides an illustration of what existing approaches can and cannot capture, tracking the innovations and expansions that have taken place in antitrust analysis as it confronts increasingly complex ecosystems. We start with what “standard” analyses of given markets might offer; these could be relevant for the most basic multi-actor ecosystems seen through the lens of vertical relations, such as those found in distribution networks. More plausibly, some simple ecosystems may be captured with an aftermarket approach. Inasmuch as ecosystems impose limits to competition based on compatibility (which can be a form of non-generic complementarity) lock-in, this view, developed in particular after the landmark Kodak decision of 1992⁹, could help provide some guidance as effects on the primary market and/or the aftermarket affected the same category of

⁹ The approach followed by the Supreme Court in *Eastman Kodak Co v Image Technical Services, Inc*, 504 US 451 (1992), emphasized whether consumers ‘full cost’ the primary product (original equipment) and secondary product (replacement parts) at the outset. If a significant proportion of buyers made their choice taking into account the lifetime costs of the product, this indicated that there was one relevant market for the original equipment and spare parts combined. If information imperfections impeded such full costing to be done at the outset, the competition authorities analyzed the primary and secondary products as two separate relevant markets, the product market and the aftermarket, as in this situation market participants could be exploited in aftermarkets for products they were locked in, even if the primary market was competitive.

users. However, the aftermarket perspective does not cover all the types of lock-in engendered by multi-sided platforms, which feature different market sides and therefore different categories of users that may be affected.

Consider, for instance, the conundrum faced by the Microsoft cases in the 1990s where Microsoft bundled MS-DOS and Windows with other services such as its proprietary media players, including Windows Media Player (“WMP”). The complementor/aftermarket approach would have probably found no fault with this, inasmuch as consumers bought a “bundle”—which would lead to the market being defined in broader terms, absolving Microsoft of exerting lock-in power in the media player market. The approach was changed through the US and EU cases, when the traditional tool of market definition extended to take into account the indirect network effects arising out of the feedback loop between end-users from one side of the market and developers or third-party hardware manufacturers from the other. This allowed regulators to gauge the effects at each side of the platform—on final consumers, on developers in the specific vertical (media players), and on hardware manufacturers. They isolated the basic functionality of the platform as a “market”—here, the OS used on PCs—and, having found dominance at that level, they focused on how it could be leveraged by an anticompetitive practice (“tying” the OS to other services, without affording users any choice) in the markets for specific verticals (such as media players). Attention shifted to cross-market externalities between platform sides, and to the impacts this had for the customer—which is also the approach authorities have taken for other OS ecosystem cases, such as the Google Android cases (Russian FAS, 2016; European Commission, 2018).

Yet even this approach falls short of tackling ecosystem competition. Much as we shifted our approach through landmark cases on aftermarket/complementary products (such as Kodak) to consider MSP, tying, and network externalities (Microsoft), we now need to adjust our approach to address the competitive issues that emerge in ecosystems. Rather than emphasizing a single core market (here, the OS), we should look at the nature of ecosystem dependencies head-on, the lock-in that ecosystem orchestrators can impose on complementors and users by inducing non-generic co-specialization that restricts competition and entry. It is the very *structure* of the ecosystems (here, MSPs) and the

ability of a dominant player to be at the core of a multi-product ecosystem which leads to competition problems- rather than the dominance in any particular market.

Similarly, the market definition approach does not cope well with more complex ecosystems based on transaction or matching platforms, such as credit-card networks, in which the two sides interact on the platform simultaneously¹⁰. This led to different approaches regarding market definition in the EU and in the US regarding transaction (matching) platforms.

The engagement with transaction platforms from regulators, useful as it is, though, still does not fully capture the complexity of competitive interactions that emerge in ecosystems which are based on advertising –based multi-sided media platforms, such as those operated by Google and Facebook. These are structurally different from transaction or matching platforms, as indirect network externalities here are unidirectional rather than reciprocal: advertisers benefit from larger audiences, but not *vice versa*. Also, the platform provides customer data and access to advertisers as a result of customer traffic that can generate a unique ability to offer a valuable asset that resulted from a non-monetary dominance in another field (search or social media), and they use multi-product ecosystems to increase their hold on customers. In advertising-based MSP the different sides of the platform have different interests as the MSPs may generate positive value for some participant groups or for the MSP itself but negative value for other participant groups. For instance, any advertising platform should balance the advertisers' interest to expose users to intensive advertising, while end users may prefer less intrusion. For ecosystems such as these, we argue that we should explicitly focus on the ecosystem level.¹¹

¹⁰ As the majority opinion of the Supreme Court in Amex explained, “the key feature of transaction platforms is that they cannot make a sale to one side of the platform without simultaneously making a sale to the other. For example, no credit-card transaction can occur unless both the merchant and the cardholder simultaneously agree to use the same credit-card network.” [16-1454 Ohio v. American Express Co. \(06/25/2018\) \(supremecourt.gov\)](#)

¹¹ Two related limitations of the relevant market concept are that it is backward-looking, neglecting the risk of creating lock-ins that might grow stronger over time; and that it disregards the power that flows from the incidental use of data. If the market valuations of ecosystem firms are anything to go by, financial markets are

To illustrate, a social media platform may generate value for users from lock-in (one wants to be where ones' friends are). These lock-ins make app developers want to participate, so they can access customers. Customer engagement generates incidental information on users (data). This data can be used for advertising. Advertising (should) have a cost for users who are bombarded with offers; advertising technology firms are interested in crunching ad data to make it usable; advertisers are interested in using this data to generate sales. Data and customer access can also be used to unduly facilitate adjoining market entry. Thus, the social media platform owner that has built a *multi-product and multi-actor ecosystem* can dominate. It can impose its own ad-tech services as it becomes more multi-product than before. It can restrict customer choice, as the social media lock-in means users don't really have seamless access to other complementary services elsewhere. It could also impose abusive terms of trade on complementors (such as advertisers or app developers), which they would have to tolerate to maintain access to users.

Dominant ecosystem actors can potentially leverage their relationship with the final customer, unduly restricting access, choice, or innovation. They can also monetize the knowledge they gain from consumer usage patterns, either to directly benefit their own activities (or those they broker) or by selling information about and access to the customers through advertising; they can also get an unfair advantage in entering adjacent markets, further assisted by opportunities offered by AI and real-time experimentation and the funding offered by the capital market in anticipation of these benefits.¹² The motives and the ability to exercise such power depends, in turn, on the *business model* and the *architecture and governance of the ecosystem*.¹³

far more forward-looking than regulators in appreciating that customer ownership and data confer an outsized advantage on ecosystem orchestrators.

¹² The future-forward orientation and customer value relates to the "scope creep" we have seen ecosystems engage in. See Jacobides et al (2021); Lianos & McLean (2021)

¹³ For a detailed analysis of business models in the context of Big Tech, which explains in particular how Google, Facebook and Apple monetize their advantage (and as such, what potential challenges this might raise), see Jacobides et al (2020) who also discuss and how the EU regulatory drive might affect these firms, based on their business models- and that of their ecosystem complementors. For an overview of research on ecosystem governance, albeit in the context of software ecosystems, see Alves et al (2017).

Table 2: Market vs. Ecosystem: Different competitive scenarios

Scenario	Example	Affected parties	Dominant Effects	Potential (future) competition issues	Nature of interaction	Main Competitive focus	Appropriate competition law tool
Standard	Distribution network (e.g. Walmart)	Final users	Substitutability	Standard barriers to entry analysis	Market Competition	Interbrand Intrabrand	Relevant market
Aftermarkets or Two-sided Platforms	Primary product with replacement parts (e.g. Kodak) Spotify	Final users	Specific Complementarities (supply side synergies) Demand side synergies	Standard barriers to entry analysis Network effects	Systems Competition	Interbrand Intrabrand	Narrow or Broad Relevant market depending on users' path dependency Ecosystem
Operating Systems (Production) Platforms	Microsoft, Apple	Users each side Complementors	Cross-side network externalities	Standard barriers to entry analysis Network effects	Multi-sided platforms	Inter-ecosystem Intra-ecosystem (vertical)	Narrow Relevant market Ecosystem
Transaction platforms	Payment system (Visa, Amex) and match-making platforms in general	Users each side	Reciprocal cross-side demand-side externalities (consumption synergies)	Standard barriers to entry analysis Network effects	Multi-sided Platforms	Inter-ecosystem	Narrow Relevant market with consideration of out-of-market efficiencies (EU) or Broad Relevant market (US) Ecosystem analysis; abuse wrt complementors
Digital Ecosystems	Search engine-based, multi-product scope (Google) Social network-based, multi-product scope (Facebook) Device and S/W based, multi-product scope (Apple) eCommerce-based, multi-product scope (Amazon) ?Future 5G IoT Platform-based (e.g. connected cars)	Final users (locked in both for each product / service and for the overall bundle) Complementors in each of the multi-actor ecosystems operated Future users and complementors	Non-generic complementarities leading to current/future lock ins One-directional direct, indirect and Cross-side demand / network externalities Economies of scale and learning leading to power imbalances / predation Information generated incidentally, asymmetrically used Feedback Loops entrenching incumbents	Network effects Portfolio effects Data asymmetry => learning effect issues Trajectories of innovation => de facto entrant discrimination	Multi-product and multi-actor ecosystems, supported by (potentially connected) Multi-Side Platforms and Attention markets	Inter-ecosystem Intra-ecosystem (vertical and horizontal) Innovation competition	Ecosystem analysis (architecture, governance, business models); identification of potential areas of abuse wrt final customers and complementors Analysis of impact of action/inaction on competition and innovation Consideration of governance / ecosystem architecture as substitute / complement to regulation ex ante / post

In particular, we argue that to assess power and dominance we need to focus on the dual topic of actors' business models (Caffarra et al, 2019; Caffarra & Scott Morton, 2020) and ecosystem architecture and governance- which are underexplored and often misunderstood topics.¹⁴ This requires a significant shift of focus. Regulators need to understand how surplus at the ecosystem level is divided between ecosystem participants, and evaluate the efficiency and/or fairness of the practices used. A full understanding of an ecosystem's hold on its complementors encompasses both the uniqueness of the data it has on customers, and other plausible alternatives that can limit its power. Ecosystems shape the opportunities available to customers, but also to those complementors that want to innovate and expand. Facebook's acquisitions of WhatsApp and Instagram, for instance, meant that customers were deprived of alternative platforms that would have both increased innovation competition and helped foster alternative technologies. This suggests we should consider not only how ecosystems operate, but also how they shape trajectories of innovation and competition. Competition authorities should thus take a more dynamic perspective on the situation¹⁵.

¹⁴ As we explain in section 4.4, the use of the term "business model" by recent competition research has limited overlap with the use of the term in the literature- inconclusive as it may be (see Zott et al, 2011). Business models denote the plan for the successful operation of a business, identifying sources of revenue the intended customer base, products, and details of financing. It describes the rationale of how an organization creates, delivers, and captures value, in particular economic, social and cultural contexts. We agree that business models, in particular those of ecosystem orchestrators and dominant actors, are important in understanding both the motive and the opportunity for restrictions to competition. But we feel that, even more than the business models themselves, what matters is the sets of rules, roles, and relationships in a sector - what Jacobides et al (2006) call the "industry architecture", which also encompass what Janssen (2019) calls "ecosystem governance." They correspond to what Caffara, Scott Morton, Athey etc have recently dubbed, rather *ad hoc*, "business models". The norms of engagement, part and parcel of the endogenous process of industry architecture formation, shapes ecosystem conditions. We thus *recommend we explicitly focus on "ecosystem architecture" to denote the rules and roles of ecosystem operation* which will include the roles and relationships of all parties that engage in an ecosystem, the conditions for monetizing and payments used. *Ecosystem governance* (see Janssen et al, 2019) defines who is allowed to compete in a (multi-actor) ecosystem and under what terms; how disputes are resolved; etc., as often these rules are made explicit (even though there are many circumstances that the orchestrator decides at will- an issue which itself gives rise to concerns of abuse.) Given the scope and importance of ecosystems, governance attributes of the ecosystem itself can establish whether dominant players / orchestrators have motives and ability to impose their will. Regulation might thus be complemented (possibly partly substituted) by a robust governance structure. See, for views in favour of (at least some) self-regulation, Cusumano et al (2021).

¹⁵ As Jacobides and Tae (2015) have shown for computers, the lack of intra-ecosystem competition leads to bottlenecks absorbing value-add—a finding consistent with Bresnahan & Greenstein's (1999) observation

4. Tackling the Regulatory Gap

Regulating a complex and novel system is a difficult task. Regulators need to step back and develop the analytical lens through which they can tackle problematic behavior. However, there is no “ecosystem failure” theory equivalent to theories of market failure (Moore, 2006). The concept of market failure characterizes a system that falls short of the ideal, but we have no theory of ideal ecosystems—and the multiplicity of recent regulatory narratives shows that we are still a long way from consensus. In this section, we briefly review the various regulatory approaches, relating them to conventional competition law.

4.1. Employing the conventional competition law framework: Stretching the limits of our tools

The concept of “ecosystem” is not entirely new in competition law enforcement. In the Google Android case, the European Commission has already recognized the importance of ecosystem competition. The EC noted that in view of the integration of Google Play Library Services in a large number of third-party apps, and the fact that access to the Library is necessary for these apps to function properly, if a competing Android app store developer sought to replace the Play Store, it would need “to undertake substantial investments to replicate the whole Google ecosystem” (European Commission, 2018).

The Commission also drew attention to the “lock-in” effect of ecosystems for consumers in Amazon e-book Most Favoured Nation clauses¹⁶. It held that Amazon operated a closed ecosystem with its Kindle e-book reader, as customers who owned a Kindle could only use that e-book reader for e-books purchased in Amazon’s Kindle store, and furthermore these e-books could not be read on other e-book readers (European Commission, 2017). This means customers who had already purchased Kindle e-books might face costs in switching

that most digital platforms in the computer sector in the past have lost their central positioning as a result of Schumpeterian innovation competition (also see Bresnahan et al, 2012)

¹⁶ An MFN clause—also called a “most favored customer” (MFC) or anti-discrimination clause—is a promise by one party to a vertical relationship—a supplier—to treat a buyer as well as it treats its best, most-favored customer. The supplier commits to a specific retailer that it will match any price reduction offered to another retailer. MFN/MFC clauses protect retailers from subsequent price reductions that might be given to other firms.

to another e-book platform. In both cases, the Commission proceeded by adapting its traditional relevant market-focused approach.

Ecosystems also featured prominently in the EU “Digital Era Competition” 2019 report, which acknowledged that although “firms compete to draw consumers into more or less comprehensive ecosystems, markets for specific products or services will persist from a consumer’s perspective, and should continue to be analysed separately, alongside competition on (possible) markets for digital ecosystems” (Cremer et al., 2019: 4), thus taking the view that ecosystem competition may not replace the traditional focus of competition law on relevant market and cross-demand or supply-side substitutability.

The EU Digital Era Report also emphasized the “lock-in” problem arising from the fact that a dominant actor in an ecosystem may try to expand into neighboring markets to maintain their grip on captive consumers. It acknowledged the ecosystem as a field of competition distinct from the relevant market, and the need for intervention in this context (Cremer et al., 2019, 34; 53), yet opted for the incremental approach of defining “ecosystem-specific aftermarkets” to take system competition into account. This neglected the issue of power in multi-actor ecosystems.

In the absence of new theory, we can only analyze ecosystems within the context of market definition. The Commission’s 1997 Market Definition Notice defines the “relevant market” broadly as aiming to determine “in a systematic way the competitive constraints that the undertakings involved face” (EU Market Definition Notice 1997). However, market definition focuses on substitutability, and the metric used to measure market power—market share—does not account well for the issues raised by intra-ecosystem competition, where the relevant issue is not substitutability through horizontal rivalry (Crane, 2019) but competition for the rents emerging from complementarities (Crane, 2019; Lianos, 2019b).

There are also significant international differences in terms of how the issue of market definition is dealt with. The recent revision of the EU Market Definition Notice could have offered an opportunity to adapt the market definition tool to ecosystem competition, although the focus seems so far limited to multi-sided markets/platforms and zero-priced markets. This is not the approach followed in US antitrust law, which, for transactions

completed jointly by a card-holder and a merchant, accepted that it will proceed by evaluating *both* sides of a two-sided transaction platform in order to assess the net effect on competition (US Supreme Court, 2018). As such, US law seems more open to more complex trade-offs between different groups of users/consumers. This approach might be able to accommodate a limited subset of ecosystems, such as two-sided markets (e.g., payment systems), albeit with some difficulty—see Hovenkamp (2019). It is, however, ill-equipped to deal with MSPs such as ecosystems funded by advertising (such as Facebook and Google), in which the feedback loops between the various categories of users on each side of the platform (users, advertisers) are less closely interrelated, as Table 2 suggests. The antitrust cases initiated against Google (and, more recently, Facebook) provide a good example of the problems with the US Supreme Court’s approach, but also outline the competitive dominance issues in ecosystems.

We have also seen pushback, both from potential subjects of regulation and from academics. One radical view is that the scale of the “lock-in” problem does not justify the cost and complexity of enforcing competition law on ecosystems (Crane, 2019: 423). However, this position seems unsupported by recent evidence; the 2019 EU, US, and UK reports; and the rapidly growing market capitalizations of Big Tech.

A related argument focuses on dynamics of competition. Teece and Coleman (1998) argue that the dynamic nature of competition means that any position of strength is temporary and can be challenged. In essence, this assumes that the “bad” rents will be eroded by competition soon enough—both the inherently short-lived Schumpeterian rents, driven by the fact that a firm is “in the right place, at the right time,” and the Ricardian rents, driven by a firm possessing something scarce. In this view, only blatant violations of competition (“Porterian rents”) are worthy of attention. This thesis, of course, relies on the erodibility of rents and the contestability of markets. However, lock-ins and feedback loops suggest that such Ricardian rents are actually fairly robust, and much of the current concern relates to the behavioral and economic forces that make them so. This is borne out by the success of the dominant tech firms (which some analysts ascribe to their superior “dynamic capabilities”—a position perilously close to the classic Panglossian fallacy in Voltaire, 1759).

Another argument holds that the competition game has been transformed, making lock-in concerns obsolete. Large digital platforms—i.e. Big Tech—invade adjacent and/or overlapping fields, in which they become strong rivals (Varian, 2017). Hence, the argument asserts, it is irrelevant whether they dominate specific ecosystems, as they compete with each other by offering a mix of products and services and, thus, form competing ecosystems. The dynamic nature of competition and disruptive innovation in technology markets generates uncertainty, pushing ecosystem orchestrators to expand their output in order to become the next “(disruptive) dominant design.” This calls for a “moligopoly screen” (Petit, 2020): a space free of competition law in which digital platforms may regulate their own ecosystems. Such a view makes some fairly heroic assumptions on how contestable markets are, and assumes a strong competitive interaction between the Big Tech platforms—all of which seems at odds with the facts (NYT, 2020). We have recently seen evidence of significant collusion—illustrated, e.g., by the reported \$10 billion paid by Google to remain the default search engine on Apple devices, which clearly indicates the value of such forbearing arrangements. Moreover, these views also bypass issues of *intra*-ecosystem competition. As such, we believe that approaches of this sort tend to assume (or wish) the problem away, rather than addressing it.

The challenge is that ecosystems are prone to market tipping. One example is the Internet of Things (IoT), where we may observe the emergence of “dominant digital ecosystems and gatekeepers.” A patchwork of *ad hoc* solutions have been tried here, resting on the regulation of abusive conduct—for instance, by providing specific remedies in areas such as data access and interoperability, or prohibiting certain forms of self-preferencing. However, regulators have yet to adapt the competitive assessment to the ecosystem specifically (European Commission, 2020), which brings us to the second approach.

4.2. Regulating ecosystem competition directly with ex ante laws

As we have seen, the traditional *ex post* competition-law framework struggles to accommodate all dimensions of ecosystem competition. The tendency over the last few months has been to bridge the gap with new *ex ante* regulation. This would enable regulators to address all the costs of ecosystem power, both social (harm to democracy,

privacy, fairness) and economic (price, innovation, equality of opportunity). In this regard, the nascent European regulatory framework focuses on digital platforms (European Commission, 2020), and one of its goals is to ensure sufficient intra-ecosystem competition, with the aim of protecting complementors. This may address the *multi-actor* ecosystem context, as a means to alleviate intra-ecosystem competition issues.

One possibility would be to address any exploitation of complementors directly by mandating the desired “fair” results (e.g. prices, ranking). This is usually the case in traditional regulatory interventions when an economic entity constitutes a natural monopoly. While this has intuitive appeal, we must start with a clear sense of both the bottleneck and the regulatory remedies—which is where the analogies between natural monopolies and digital platforms may be problematic.

Some have claimed that dominant digital platforms have similar characteristics to natural monopolies (Ducci, 2020). Core activities such as data centres for search and logistics for online delivery services, they argue, require high fixed costs, and entities enjoy declining average costs once they have paid the “entry fee” (fixed costs of production). However, digital platforms, unlike traditional utilities, do not face declining marginal revenues as production grows, because of increasing returns to scale and learning-by-doing effects—as well as incentives to grow provided by financial markets’ valuations.

Whether one agrees with the analogy or not, a utility-like approach to regulation usually takes the form of rate regulation—which, in our context, would allow a digital platform to cover its total cost plus a fair return, or limit prices on the “money” side. It is also theoretically possible to impose non-price regulation—first, in order to limit externalities resulting from digital platforms’ incentive to grow by capturing more surplus value; or, second, to limit their ability to harvest personal data (Economides & Lianos, 2019; Condorelli & Padilla, 2020). However, designing such regulation is very difficult, as regulators would need to determine the appropriate rate of return, plus the regulation might inhibit orchestrators’ incentive to innovate. If regulation focuses on final consumers, determining the socially optimal output will also involve complex societal choices (for instance, limiting ads shown alongside search results) (Ducci, 2020).

These options are far-reaching, and no jurisdiction is so far contemplating a full-fledged utilities-style regulation in this context. A lighter approach would be a form of *ex ante* conduct regulation for specific behaviors, which would be blacklisted and eventually prohibited. This idea has been put forward by various academic reports (Cairncross, 2019 for the soft law approach; Furman, 2019 for a hard law approach) and implemented in some jurisdictions (e.g. Japan¹⁷).

In the EU, a first round of regulation culminated with the adoption in 2019 of Regulation 2019/1150¹⁸ (the so-called “Platform to Business Regulation”), which imposes some transparency obligations regarding, for instance, the delisting of products, or the main parameters determining ranking to all information society online intermediation services¹⁹, in view of their asymmetrical bargaining power over business users. However, this regulation only covers services that are provided on the basis of a “contractual relationship” (Bania, 2019), and thus does not cover the “uncontract” situation that structures most interactions within ecosystems (Zuboff, 2019: 208; Lianos & Eller, 2020). Moreover, it does not set any specific market- or ecosystem-related threshold for its application, and subjects all online service intermediation providers to the same duties, regardless of their competitive importance. Finally, the Regulation mainly relies on a light institutional mechanism involving alternative dispute resolution and private enforcement through collective redress, and therefore fails to address lock-in.

New laws have emerged to tackle the power of platform businesses (see Kerber, 2019), and the EU has put forward a number of new regulatory initiatives and consultations in 2020. These include the New Competition Tool, the update to its Platform-to-Business regulation

¹⁷ Japan Fair Trade Commission, Interim Discussion Paper: Improvement of Trading Environment surrounding Digital Platforms (December 2018), 6-8.

¹⁸ Regulation 2019/1150, of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services, [2019] OJ L 186/57.

¹⁹ Information society services are defined in point (b) of Article 1(1) of Directive (EU) 2015/1535 of the European Parliament and of the Council [2015] OJ L 24/1, which covers “any service normally provided for remuneration, at a distance, by electronic means and at the individual request of a recipient of services,” a list of such services being included in Annex 1 of the same Directive.

(European Commission, 2020 Digital Services Act²⁰), and regulatory instruments for gatekeepers in the EU (European Commission, 2020 Digital Markets Act (DMA ²¹)). Inspired by the narrative of openness, the DMA proposal draws on the 1990s effort to open up telecoms access through “asymmetric regulation” (Alexiadis & de Streel, 2020). The idea is to place *ex ante* regulatory obligations on undertakings that enjoy “significant market power” (European Commission, 2018²²), but the reliance on the concept of “relevant market” in the telecoms regulatory framework raises the limitations explained in Section 4.1²³.

The concept of gatekeeper, put forward in the DMA, offers a new threshold for *ex ante* regulatory intervention that breaks with the “relevant market” approach (Article 3 of the DMA, 2020; see Table 1 above). These criteria rely on a number of evidential thresholds that help to establish that the core platform provider is indeed a gatekeeper. The DMA also provides for the possibility of a case-by-case assessment even if a platform does not meet the thresholds above, on criteria including size (turnover, market capitalization, operations)²⁴ and user numbers²⁵—thresholds that should be met for three consecutive years. A presumed gatekeeper may also rebut such a finding by referring to the same criteria. Notable by its absence is any reference to the concepts of either *multi-product* or *multi-actor* ecosystems.

²⁰ Proposal for a Regulation of the European Parliament and of the Council on a Single Market for Digital Services (Digital Services Act) and amending Directive 2000/31/EC, COM/2020/825 final, available at [EUR-Lex - 52020PC0825 - EN - EUR-Lex \(europa.eu\)](#).

²¹ Proposal for a Regulation of the European Parliament and of the Council on Contestable and Fair Markets in the Digital Sector (Digital Markets Act), SEC (2020) 437 final, available at [proposal-regulation-single-market-digital-services-digital-services-act_en.pdf \(europa.eu\)](#).

²² Communication from the Commission — Guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services, [2018] OJ C 159/1.

²³ Note, however, that the European Commission in soft law has analyzed the concept of dominant position as equivalent to that of substantial market power: see, Communication from the Commission— Guidance on the Commission’s enforcement priorities in applying Article [102 TFEU] to abusive exclusionary conduct by dominant undertakings [2009] OJ C 45/ 7, para. 10.

²⁴ Specifically, the proposed 12/2020 thresholds are an annual EEA turnover \geq €6.5 billion in the last three financial years; *or* Average market capitalization (or equivalent fair market value) \geq €65 billion in the last financial year; *and* provides platform service in at least three EU Member States.

²⁵ Proposed 2020 thresholds are that a core platform has > 45 million monthly active end users established or located in the EU *and* > 10,000 yearly active business users established in the EU.

Pragmatically speaking, the criteria for identifying a gatekeeper relate to the requirements of the *ex ante* regulatory tool, which is to determine with legal certainty which entity falls under the scope of the regulation, so as to ensure compliance “by design.” However, the proposed regulatory scheme is also inspired by the co-regulation/regulatory dialogue or “participatory” approach put forward by some academics (Tirole, 2019) or industry players (Bethel et al.) as a solution to the informational asymmetry of the regulators of digital platforms (Tirole, 2019), particularly in the context of “anticipatory regulation” (Amstrong et al., 2019).

The challenge here is that, as we have seen, there is as yet no underlying regulatory theory for digital ecosystems—particularly when we consider more decentralized blockchain-based platforms (Lianos, 2019a). The DMA takes this into account by allowing the presumed gatekeeper to rebut their status through dialogue (Art. 3(4) DMA). The flip side of this approach is that the gatekeeper criteria remain formalistic, and it is not clear what the orchestrator will be gatekeeper *to*. Also, the DMA neglects the *business models* used (Caffarra & Scott Morton, 2021). Although the Commission and the preparatory experts’ reports (CERRE, 2020) often mention “ecosystems²⁶,” nowhere in the DMA proposals is the concept given any operational function.

Finally, *ex ante* regulation does not obviate the need for *ex post* intervention. First, many perceived online platforms are not entirely digital, in the sense of providing information society services. Although the Court of Justice of the EU has recently characterized platforms such as Airbnb as information society platforms²⁷, this is not the case for Uber or Deliveroo, among others²⁸. Second, the DMA does not cover all digital platforms—even those that may be considered as information society services, such as electronic payment systems, which are not included in the list of “core platform services” (Art. 2(2) DMA), and for which there is specific regulation at the EU level²⁹. Third, the regulation does not cover

²⁶ Recitals 3 and 14 of the DMA Proposal.

²⁷ See, Case C 390/18, Airbnb Ireland, ECLI:EU:C:2019:1112.

²⁸ See, for Uber, Case C-434/15, Asociación Profesional Élite Taxi v Uber Systems Spain SL, ECLI:EU:C:2017:981.

²⁹ In particular Directive 2015/2366, on payment services in the internal market [Payment Services Directive 2], [2015] OJ L 337/35; Regulation 2015/751 of the European Parliament and of the Council of 29 April 2015

regional or local digital platforms that do not satisfy the DMA thresholds; nor does it cover minor global or regional gatekeepers. No doubt, a large regulatory player such as the EC needs to agree regulatory remedies with major digital platforms of the size of GAFAM, where smaller national regulators or national competition authorities (NCAs) may be less successful. However, some NCAs in large EU member states have already successfully intervened in this regard, by using the non-conventional *ex post* competition law framework. We turn to this next.

4.3. Non-conventional *ex post* competition law framework (in the EU)

We now delve deeper into European dynamics, where there has been a stronger push to regulate ecosystems directly—due both to the European sensitivity on issues of power, and to the geopolitical fact that overbearing orchestrators are based in the US. Be that as it may, despite the recent effort to harmonize competition law enforcement in the EU³⁰, member states have maintained flexibility over implementing national competition law (Monti, 2019). This has usually been through some form of *ex post* enforcement against non-structural dimensions of economic power, such as economic dependence or bargaining power in the context of a bilateral relation, rather than market power (ability to raise prices profitably and reduce output) in a defined relevant market (Lianos, 2019b). One example is Germany, where the competition authority (Bundeskartellamt, or *BkA*) has already taken remedial action against abusive conduct in ecosystems³¹. Elsewhere, recently proposed Belgian competition legislation deals with the abuse of a relationship of economic

on interchange fees for card-based payment transactions, [2015] OJ L 123/1; and the recent regulatory proposals put forward by the Commission: Commission, Communication on a Retail Payments Strategy for the EU, COM(2020) 592 final.

³⁰ In particular Regulation 1/2003, on the implementation of the rules on competition laid down in Articles 81 and 82 of the Treaty, [2003] OJ L1/1; Directive 1/2019, of the European Parliament and of the Council of 11 December 2018 to empower the competition authorities of the Member States to be more effective enforcers and to ensure the proper functioning of the internal market, [2019] OJ L 11/3.

³¹See, in particular, the Facebook decision where the *BkA* differentiated between user data that had been generated through users using the Facebook service, and user data obtained from third-party sources that were either controlled by the Facebook corporate group, such as WhatsApp, Oculus, Masquerade etc., or through the use of Facebook programming interfaces on third-party websites or mobile apps (via the Facebook developer platform and Facebook Business Tools), which formed part of the broader third-party Facebook ecosystem, mandating by way of a remedy, an “internal unbundling” of personal data harvested by Facebook from its broader ecosystem: Bundeskartellamt, Fallbericht v. 15.2.2019 zur Facebook-Entscheidung v. 6.2.2019, Az. B6-22/16..

dependence. Justifying this law, Belgian legislators made specific reference to the legislative gap concerning digital platforms³². French competition authorities have applied provisions for the abuse of economic dependence—which form part of their rulebook on free and fair competition³³—to non-dominant firms in a market³⁴. This shows that national legislators favor provisions that apply *ex post* and afford greater flexibility than a formal regulation.

Although these non-conventional approaches do not engage directly with business ecosystems, they do enable the consideration of different dimensions of power that are not related to a dominant position in a relevant market. Dependent firms are generally characterized by a lack of economic alternatives, while the prohibited abuses generally involve some form of coercion by the larger business partner (Bougette et al., 2018). The concept of “obligatory business partner” or “unavoidable trading partner” also plays a role, although this relates more to the fact that competitors may not be able to compete for an individual customer’s entire demand in the same relevant market, in view of the *sine qua non* character of the “unavoidable” undertaking’s products³⁵. The concept has been compared to that of “intermediation power” in the EU Digital Reports (Cremer et al., 2019).

As a sole example of out-of-the-box thinking, the new provision in the 10th amendment of the German Competition Law engages indirectly with the concept of ecosystem, as it establishes a system of control of unilateral abusive practices³⁶ providing the BKA with the

³² Loi modifiant le Code de droit économique en ce qui concerne les abus de dépendance économique, les clauses abusives et les pratiques du marché déloyales entre entreprises, Art. 4, http://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&cn=2019040453&table_name=loi.

³³ Article L. 420 2, alinéa 2 du code de commerce.

³⁴ Case 20-D-04 16 March 2020 «relative à des pratiques mises en œuvre dans le secteur de la distribution de produits de marque Apple», https://www.autoritedelaconurrence.fr/sites/default/files/integral_texts/2020-06/20d04.pdf.

³⁵ See, Communication from the Commission— Guidance on the Commission’s enforcement priorities in applying Article [102 TFEU] to abusive exclusionary conduct by dominant undertakings [2009] OJ C 45/ 7, para. 36.

³⁷ While strictly speaking one might focus on what *actually* generates revenues, it is also important to investigate what generates capital market exuberance in anticipation of revenues, since the incentives inherent in an economic system are not only those of cash flows, but also those that are able, in anticipation, to generate capital market excitement and as such value for ecosystem orchestrators. Given the fact that capital markets are more focused on growth than revenues (see Khan, 2017), this can lead to systematic distortions, where orchestrator abuse could be focused on exciting capital markets more than generating revenues. For a specific example of these dynamics of ecosystem growth, see Teng & Jacobides (2021) on the

possibility of acting against digital conglomerates that control an entire digital ecosystem comprising several distinct markets. However, the provision is not directly applicable, and requires regulators to formally establish by decision that such a position of strength is given with respect to a specific firm. An exhaustive list of types of abusive behaviour is also included, establishing a presumption that certain types of conduct will be found illegal unless the firm proffers sufficient evidence demonstrating an objective justification. The provision enables the BKA to prohibit the conduct *ex nunc*—that is, for a period after a decision has been reached. However, it also allows the BKA to order the firm to refrain from specific types of abusive conduct even if it has not yet adopted them, thus granting this provision at least some *ex ante* deterrent effect.

It is still unclear how the DMA will affect member states' options to use additional mechanisms to fill the ecosystem gap in EU competition law. The proposed regulation seems to leave some policy space by acknowledging (in Art. 1(6)) the complementary, and not substitutive, role of the new regulation. Hence, NCAs may intervene if firms engage in conduct not explicitly prohibited by the DMA, while there is still scope for competition law intervention against digital platforms that are not “gatekeepers” according to the DMA.

In conclusion, despite its advantages with regard to enforcement speed and deterrent effect, the *ex ante* regulation of the DMA is no substitute for a properly framed *ex post* competition law regime. In reality, the two mechanisms can complement each other, in particular in order to avoid market tipping and prevent lock-in. However, the rigidity of *ex ante* regulation may become a problem, in view of the rhythm of technological evolution and the emergence of new business models and practices. This concern also influenced regulatory strategy in the UK, which chose the more flexible concept of “strategic market status” as an intervention threshold, rather than any quantitative thresholds and criteria. The idea of combining *ex ante* with *ex post* measures was also part of the motivation of the Law Commission put in place by the Greek government during Spring 2020, which prepared a draft provision in Greek competition law. We will examine this provision once

growth of Grab in Southeast Asia, and for the broader issues of financialization, which links with ecosystems, see Lianos 2019b & Lianos & McLean 2021 .

we have considered another critical theme that is starting to emerge in regulatory discussions: business models.

4.4. *The role of business models, industry / ecosystem architectures and governance*

As noted earlier, ecosystems raise new types of competition concerns. Dominant actors can bundle a range of offerings in a multi-product ecosystem, and exploit independent firms that are connected through multi-actor ecosystems that demand some non-generic investments, and may even constitute a gateway to end users. Whatever tools we use, they must be able to address these new issues. We argue that it is best to recognize ecosystems as a distinct, unique focus of regulatory action, and consider whether they impede competition or restrict innovation. To do so, we must first establish the existence of an ecosystem and discern its structure (or architecture). Only then can we focus on the actions of dominant firms that might restrict competition.

To assess whether ecosystem orchestrators have the incentives and ability to abuse their position, we must consider their business models (a relentlessly debated construct—see Zott et al, 2011; Novak, 2014). More specifically, we need to examine *monetization*—i.e., the ways in which revenues or growth are generated³⁷. That is, we suggest that we should “follow the money”, mapping what drives profits in the ecosystem, and what might lead to dominance. More important, we believe that we should track the “industry architecture” of ecosystems (Jacobides et al, 2006)—the “rules, roles, and relationships” that pertain to the division of labor, which is probably what recent work has referred to, perhaps confusingly as “business models” (Caffarra et al, 2019; 2020; Caffarra & Scott Morton, 2021), as well as the governance of multi-actor ecosystems- the rules of engagement between the different parties (see Janssen et al, 2019, on software ecosystems, for an analogy).

³⁷ While strictly speaking one might focus on what *actually* generates revenues, it is also important to investigate what generates capital market exuberance in anticipation of revenues, since the incentives inherent in an economic system are not only those of cash flows, but also those that are able, in anticipation, to generate capital market excitement and as such value for ecosystem orchestrators. Given the fact that capital markets are more focused on growth than revenues (see Khan, 2017), this can lead to systematic distortions, where orchestrator abuse could be focused on exciting capital markets more than generating revenues. For a specific example of these dynamics of ecosystem growth, see Teng & Jacobides (2021) on the growth of Grab in Southeast Asia, and for the broader issues of financialization, which links with ecosystems, see Lianos 2019b & Lianos & McLean 2021 .

Understanding business models and ecosystem architectures shines a light on within-ecosystem dynamics. For instance, Facebook requires its complementors to share real-time information about customer actions, which it then resells to advertisers (as a requirement for using the “like” button). Google collects all the information from the use of its Android customers, which help it generate ad revenues, as a result of the operating principles of its ecosystem.³⁸ As for Apple, the fact that customers will often have only one phone (and one OS) means that it can squeeze even large firms like matching platform Tinder.com. We believe that potentially anticompetitive practices must be seen in the light of the orchestrator’s business model, and, more important, existing rules of engagement (the ecosystem architecture) should be scrutinized for potential anticompetitive effects on the basis of clearly articulated criteria (as the CMA is suggesting).

The same perspective also helps us assess the dynamics of competition *between* ecosystems. For instance, Apple customers are more deeply embedded in its own ecosystem, as a result of its multi-product, mutually compatible suite of offerings (iPhone, iTunes, etc), whereas other platforms like Uber and Lyft do not have such a hold on customers³⁹. Google, for instance, hands Apple over \$10 billion per year to remain the default search engine for iPhones, thus allowing it access to Apple users and their data. This collusion facilitates the coexistence of the two ecosystems without the need for competition.

As Table 2 also suggests we are in agreement with Caffarra and Scott Morton that “ad-funded digital platforms (Google, Facebook, Bing, Pinterest, Twitter, Snapchat), transaction or matchmaking platforms that are marketplaces and exchanges (Uber, Airbnb, Amazon, DoubleClick), and OS ecosystem platforms (i.e. operating systems and app stores such as iOS, Appstore, Android, Google Play Store, Microsoft Windows, AWS, Microsoft Azure etc.) [differ from each other...] in terms of (a) the *type of economies of scale* they rely on (data scale, R&D costs); (b) the *type and direction of network effects* (direct/indirect, one/both

³⁸See, ACCC, Digital platforms inquiry - final report (July 2019), available at [Digital platforms inquiry - final report | ACCC](#) For customers, there is a fine line between the convenience of customised offers and being locked in – and Big Tech know exactly how to walk it.

³⁹ This can be verified by the push of ecosystem and platform orchestrators to build multi-product “SuperApps” that envelop customers, ultimately suppressing choice and competition.

directions); (c) the *potential for multihoming* (on one or both sides), and (as emphasised again by Athey); and (d) the potential for disintermediation, either by someone else ‘introducing a different layer’ intermediating two sides of the platform (e.g. end users and business users) or finding a way for two sides to connect to each other directly.” That said, we would argue that the term “business model” is a misnomer here, as it is actually the *architecture* and the governance of the ecosystem that differs—the rules and roles that players adopt, as opposed to how they make money, or create value through their positioning. Only ecosystem architecture can show us who is a gatekeeper, whether there are obstacles to multihoming, and whether users can bypass the platform—and, as such, where true power resides. We think that future research should consider areas of focus that might create competition issues and power asymmetries, including learning dynamics and use of data among others, and focus on architecture (and governance).

In principle, business models of players, the ecosystem’s architecture and its governance can be considered in both an *ex ante* and an *ex post* approach. Many of the *ex ante* regulations, such as those put forth by the DSA/DMA, are, as a matter of fact, either business model prohibitions (in particular for Gatekeepers) or practices and ecosystem rules that are either proscribed or prohibited. We think that, rather than having blanket, and only *ex ante* rules relating to practices and business models, we may want to have an explicit focus on the business models, and the rules and roles of ecosystems which can also be considered *ex post*, with a clear articulation of the concerns that emerge in the context of digital ecosystems. We think we should consider the role of ecosystem governance,⁴⁰ a promising and as of yet under-developed tool as both a complement of effective regulation and substitute of heavy-handed regulation.

Regulation in the UK appears to be moving in this direction, albeit focusing on an *ex post* competition law-based consideration of specific practices, architectures and business models. The UK new digital markets regime put forth by the Competition and Markets

⁴⁰ This concept can encompass *private* governance, which refers to self-regulation (see Cusumano et al, 2021) *and* *public* governance which could include evidence-based competition law enforcement intended to influence ecosystem governance. This could include setting criteria for treating complementors, resolving disputes, etc.

Authority (CMA) promotes a code of conduct adapted to each firm’s business model in action, and to the industry architecture overall⁴¹. The regulatory proposal suggests that each firm that meets the test of “Significant Market Status” would have to adhere to a *specific* code of conduct that delimits what is possible. It constrains the configuration of the ecosystem’s architecture by setting out clear upfront rules relating to three qualitatively explicated objectives: fair trading (exploitation), open choices (exclusion), and trust and transparency (consumer protection). These principles are expected to be tailored to “the activity, the conduct, and harms [the code] is intended to address.” Therefore, we see a combination of business models and, even more so, industry (or ecosystem) architecture providing the basis for the “personalized law” suggestion that has been put forward as a regulatory response to digital and algorithmic issues (Busch & de Francheschi, 2020). It is also consistent with a greater focus on governance at the level of ecosystems (Janssen et al, 2019).⁴² We believe this to be the right approach. Business models and industry / ecosystem architectures were also considered in the Greek proposal—to which we now turn.

5. Breaking New Ground: The Greek Proposal and its Rationale as a Case Study

The Law Commission was tasked in early 2020 with revising Greek competition law in order to make it fit for the digital age. One of the issues that it had to grapple with was the enforcement gap resulting from the emphasis on dominance in a relevant market. The Law Commission suggested including a new provision in the Competition Act, under which the

⁴¹ *A New Pro-Competition Regime for Digital Markets, Advice of the Digital Markets Taskforce*, December 2020, see https://assets.publishing.service.gov.uk/media/5fce7567e90e07562f98286c/Digital_Taskforce_-_Advice_-.pdf, para. 12, “evidence-based economic assessment as to whether a firm has a substantial entrenched market power in at least one digital activity, providing the firm with a strategic position (meaning the effects of its market power are likely to be particularly widespread and/or significant)”.

⁴² This also allows ecosystem orchestrators to adjust their practices and ensure they can be compliant, and it means that ecosystem governance – the establishment of clear rules but also mechanisms for dispute resolution and redress – can provide an alternative to regulatory intervention. As ever broader swathes of the economy are managed via ecosystems, we need to focus on principles that the governance of the inter-organizational relations that occur within them. We should also consider whether governance arrangements should be private, or whether they should conform to some guidelines that regulators should set *ex ante*, or whether regulators should have a mandate to nudge governance arrangements that engender concerns *ex post*.

Competition Commission could prohibit an undertaking holding a dominant position in an ecosystem of paramount importance with regards to competition in Greece from abusing its dominance. This provision becomes applicable if the provisions in Articles 1 and 2 of Greek Law 3959/2011 and/or the equivalent provisions in Articles 101 and 102 TFEU cannot sort out the specific competition problem. In order to enhance legal certainty while also future-proofing the new provision, the concept of “abuse of dominant position” is *mutatis mutandis* the same as that used in the context of Article 102 TFEU—the main difference being the specific field of competition on which this dominant position and abuse are manifested, which is here an ecosystem rather than a relevant market.

The provision builds on the legal definition of the concept of “dominance” as “a position of economic strength” enjoyed by an undertaking to restrict competition “by affording it the power to behave to an appreciable extent independently of its competitors, its customers and ultimately of its consumers.” This concept does not necessarily preclude all competition, but indicates that this “position of economic strength” is of the sort to enable the undertaking “if not to determine, at least to have an appreciable influence on the conditions under which that competition will develop, and in any case to act largely in disregard of it so long as such conduct does not operate to its detriment⁴³.” However, the drafters chose not to simply add to the existing Article 2 of the national law (equivalent to Art. 102 TFEU) the term “ecosystem” next to the term “market.” They felt that the metrics for measuring dominance in the context of a relevant market could not meaningfully apply in the context of ecosystem competition, as the relations between the competing actors could not usually be qualified as horizontal, but rather as vertical or conglomerate. Also, competition would not be for market share, but for more of the surplus value of the ecosystem.

Another difficulty faced by the drafting team was to define precisely what was meant by “ecosystem.” A specific paragraph defines the concept as “a web of interconnected and largely interdependent economic activities carried out by different undertakings with the

⁴³ See, for the seminal definition, Case C- 27/ 76, *United Brands company and United Brands Continental v Commission* [1978] ECR 207, paras 65, 113; and Case C- 85/ 76, *Hoffman- La Roche & Co v Commission* [1979] ECR 461, paras 38-39.

intention of supplying products, services or a nexus of products and/or services that impact the same set of users, **or** a platform of economic activities carried out by different undertakings with the intention of supplying products, services or nexuses of products and/or services that impact the same users or different categories of users.”

The two dimensions of this definition cover both multi-product and multi-actor ecosystems. The first segment also focuses on product system competition, where all products are sold to the same set of end users. This enables the direct analysis of the vertical interactions between the consumer demand for the primary product and aftermarket products (Shapiro & Teece, 1994; Davis et al. 2012).

The second segment of the definition expands the scope of the ecosystem concept to bring in conglomerate interactions, as well as vertical ones. Platforms are economic and technological entities that establish links between different categories of users, through the complex interplay of feedback loops (negative or positive). These become connected through a specific business model that structures the specific platform’s competitive offer.

The concept of an ecosystem, as defined in this law, includes various independent undertakings linked through complex nexuses of dependency, and should thus be distinguished from conventional vertical relationships between actors in supply chains. The actors that form an ecosystem are usually independently owned, but financially and technologically interconnected due to:

- i. the highly complementary relationships between the resources needed to participate;
- ii. the fact that users are provided with a coherent and often financially integrated offering, even though multiple actors are involved; and
- iii. the sunk costs that complementors must often invest for a “seat at the table,” which may result in them being locked in.

In contrast to the *ex ante* regulation suggested by the DMA, this new provision Article 2A relates to *ex post* competition law enforcement and aims at addressing anti-competitive issues posed by the widespread prevalence of ecosystems, in the sense of covering an increasing scope of economic activities, impacting a growing number of sectors, and

becoming more consequential within them. Therefore, the new provision complements the DMA rather than being a substitute for it.

The new provision will not apply if the concern falls under the scope of the DMA, in particular “gatekeepers” as defined by the DMA, and types of conduct that are already prohibited by the DMA.⁴⁴ The pragmatic motivation is that there are various large ecosystems beyond Big Tech that may have a significant impact on the Greek economy, as platforms and ecosystems in tourism and hospitality, but also agrotech or Fintech would be outside the Gatekeeper regulation but could impact a broad swathe of the economy, given the absence of viable alternatives for Greek complementors.

The law also focuses on both business models and on the architecture of ecosystems, by explicitly stating that the Competition Commission, in considering ecosystem issues “shall take into account in particular the business model of the ecosystem, the rules governing the relations of the parties involved in it and the objective justification of the observed commercial practices.” This was meant to both focus the investigation, and delimit the scope of application of the Article, to avoid abusive application by the Commission.

One of the difficulties that the drafters had to overcome concerned the chilling effect that a provision on ecosystems may have on the development of the digital economy⁴⁵. The provision aims to reassure ecosystem participants, especially complementors, that their investments in the development of the ecosystem will not only increase their dependence on it, but also bring them a fair share of additional surplus value. The specific provision is geared towards protecting the innovation incentives of complementors, which is relatively uncontroversial given that there are no significant international ecosystem orchestrators established in Greece. However, the drafters carefully took into account the innovation incentives of ecosystem orchestrators, and included some additional precautions in terms of how the provision will be enforced.

⁴⁴ The idea here is that Big Tech should be dealt at the EU level; it would seem untoward for the competition authority of a medium sized economy to have an impact.

⁴⁵ Greece has a low DESI (Digital Economy and Society Index), and in 2020 it was ranked in the next-to-last position in the EU, sandwiched between Romania and Bulgaria.

Firstly, the Competition Commission bears the burden of proving that there is an ecosystem, under the narrow definition mentioned above, and that this is of paramount importance for competition in Greece. The reason for this condition is twofold. Firstly, it is important to identify that the ecosystem is fundamental for competition in the Greek dominion, bringing the issue under the jurisdiction of the Hellenic Competition Commission. Secondly, by emphasizing that the ecosystem must be of paramount importance, the provision takes into account the degree of inter-ecosystem or inter-brand competition for the specific functionality (e.g. search engine). This serves as a rather crude test of whether the existence of the specific ecosystem significantly affects the ability of the consumer or supplier to choose between different competitive offers. Inter-ecosystem competition is given significant weight by the economic literature on systems competition, which takes an *ex ante* competition perspective even if, once the consumers choose a system, they are likely to be locked in and *ex post* competition reduced (Matutes & Regibeau, 1988). More inter-ecosystem competition may thus compensate for less intra-ecosystem competition. This implies that the competition authority must investigate whether there is enough inter-ecosystem competition, and only if the specific ecosystem has paramount importance for competition in Greece will it proceed to the next stage and investigate whether the particular undertaking holds a dominant position in the specific ecosystem.

Nevertheless, the importance of inter-ecosystem competition should not be overestimated. If it is reasonable to expect intensive competition in the presence of two symmetrical ecosystems (Bourreau, 2020), the same result does not necessarily materialize in situations in which one ecosystem strongly dominates the others, or the ecosystems are not symmetrical (Hurkens et al., 2019). Competition may also be softer when a small number of ecosystems compete with each other (Zhou, 2017). Hence, the concept of “paramount importance” will cover configurations with few ecosystem players in which any restriction of intra-ecosystem competition may not be compensated by more intensive inter-ecosystem competition, in particular if the specific conduct forms part of a leveraging strategy to suppress competition, at both the intra-ecosystem and inter-ecosystem levels (see, for instance, Choi & Stefanadis, 2001 for bundling; Eisenmann et al, 2001 for platform

envelopment). However, in order to enhance legal certainty, it is possible to argue for a threshold of four symmetrical ecosystems in competition with each other, which would exclude any further action, on the assumption that reducing intra-ecosystem competition will not produce significant negative welfare effects in this context. In order to promote legal certainty, the provision establishes a safe harbour for configurations in which there are three more ecosystems to the one dominated by the specific firm, and which may provide a viable alternative to complementors and users.

Second, the competition authority must prove that the particular undertaking holds a dominant position in the particular ecosystem. The concept of “dominant position” is similar to that in Article 102 TFEU, which focuses on “the power of independent behaviour [of the undertaking].” However, the parameters used to measure dominance in this context are somewhat different from those for dominant position. Among the most important are the centrality of the company and the extent to which it is an orchestrator; technological advantages and the acquisition of control points that are difficult or impossible for other firms in the ecosystem to acquire; and the general financial power of the company. The inclusion of other parameters does not mean that the concept of dominant position changes conceptually—rather, it is simply enriched with new factors and criteria. More work is needed in this context (see Lianos & Carballa Schmichowski, 2020).

Third, in order to enhance legal certainty, the global turnover of the undertaking being investigated must be at least 300 million Euros—twice the threshold for triggering a merger notification obligation under Greek law. This discrepancy is justified by the fact that the possible anti-competitive consequences of a merger are likely to be more intense and long-lasting than those generated by one firm dominating an ecosystem of independent players.

Fourth, the new provisions establish an *ex post* control for abusive conduct by a dominant undertaking in an ecosystem of paramount importance. In making its decision, the competition authority must weigh the likely competition boost from the ecosystem continuing to operate against the negative consequences for those involved in it—especially their incentives to compete and innovate, and/or the likely reduction of

competition to the detriment of consumers and other ecosystem participants. The authority must also decide whether the alleged abusive conduct restricts or improves innovation and competition overall.

Finally, in order to limit the risk of chilling effects on innovation and to prevent any possible exploitation and abuse, the provision will be enforced only by the competition authority. This precludes the opportunity for follow-on private enforcement, such as receiving damages for a violation after a relevant finding by the competition authority.

6. Coda: Challenges in Putting Forth an Ecosystem Regulatory Framework

As our analysis demonstrates, regulating ecosystems is a fiendishly complicated affair. There is no doubt that the growth of ecosystems has brought new (types of) dependencies, new aspects of power, and new issues. The same two forces driving broader economic change—digitization and the dissolution of industry boundaries—have changed industrial demography and power while highlighting the shortcomings of our existing regulatory apparatus, with its focus on market definition.

For better or worse, the problems that antitrust is called upon to resolve have changed. The very definition of the word “antitrust” harks back to a time, about a century ago, when large industrial “trusts” exerted undue power. Today, in place of “trusts,” we see new forms of organization that also take advantage of the prevailing technological and institutional conditions—but also help shape these conditions to their advantage. Regulation has to evolve with the times, and we need to reassess what power in today’s ecosystems consists of, what distortions it can potentially create, and how it can be dealt with.

This is an urgent agenda, and one where independent research must develop quickly, driven by vigorous debate. The challenge is that this research might be funded by the very firms under threat of regulation, leading to the advocacy of a *laissez-faire* approach. For their part, ecosystem firms are sure to mount a functional argument: Users, they will argue, would suffer should regulation impede their business models. Well, perhaps; but it is precisely the ability to “conveniently” lock in the user that leads to problems of competition

and the constraint of innovation trajectories. End users' ease-of-use and inter-product seamlessness is precisely what can undermine real choice, and hamper competition. Over-reaching orchestrators will undoubtedly fight hard to cement their position, potentially by buying (at great cost) their latent rivals—as Facebook most probably did with Instagram and WhatsApp. But should society condone such use of force, or counter it with both *ex ante* and *ex post* tools? We feel that a balanced approach is called for—hence our review.

Finally, our experience of dealing with regulation within one of the EU's NCAs has also allowed us to observe the political economy of regulation. We speculate that it was no accident that national-level regulation of ecosystems was put on the backburner while the new generation spectrum 5G was being prepared. Likewise, discussions about major Big Tech investments have clearly had a chilling effect in terms of voting on the new law. What exactly will transpire with this proposal, we do not know, but its fate will probably be a stark reminder of the role that political economy plays in this context⁴⁶.

Our experience in debating these new ideas—both in fora of interested regulators, and with competition lawyers on a European country's law commission—also brings up issues of focus and bias. There is a natural resistance to change among practitioners of competition law, since dealing with these new problems means abandoning tried and tested tools (true or otherwise) and taking a leap into the unknown. As the criterion for action, we will probably need to consider a sector's trajectory with and without intervention—an approach that is radically different from the narrow focus on harm and remedies. That means we may need to adjust a great deal of our *modus operandi*. However, the only alternatives are to wish away the problem or pretend that we can solve it with our existing tools.⁴⁷ As we believe this article clearly shows, neither of these positions are tenable. Our only option is to bite the bullet and look ahead. In this effort, we hope that our analysis of ecosystems in competition and competition law will be a useful step.

⁴⁶ Political economy considerations will also play a role, including the relative role of EU and the NCAs, and the “lowest common denominator” risk. Likewise, such technically complex issues would require significant resourcing for regulators, whose budgets are dwarfed by Big Tech. The devil will be in the details.

⁴⁷ This approach also implies significant upskilling and resourcing of competition authorities, which need to be forward looking, engaged in exercises of weighing potential future outcomes with and without intervention. Yet as technology and economic relations become more complex, so, too, should their oversight.

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