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Ecosystems and competition law in theory and practice

Michael G. Jacobides¹ and Ioannis Lianos^{2,*}

¹Strategy and Entrepreneurship, London Business School, Sussex Place, Regent's Park, London NW1 4SA, UK. e-mail: mjacobides@london.edu and ²Hellenic Competition Commission, UCL Faculty of Laws, GS 141 Bentham House, Endsleigh Gardens, London WC1H 0EG, UK. e-mail: i.lianos@ucl.ac.uk

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*Main author for correspondence.

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 that leverage their complementors and lock in their customers, exploiting the “bottlenecks” that emerge in new industry architectures. This has 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 European Union 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 on research and our own engagement in the regulatory process.

JEL classification: K21, L1, L12, L4, L41, L5, L86, L88, M21

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 and Gawer, 2013; Parker and van Alstyne, 2016; Cusumano *et al.*, 2019). Interest in GAFAM's ecosystems—that is, the groups of cospecialized firms that they depend on—primarily focused on the strategies that underpin them (Iansiti and Levien, 2004; Adner, 2013, 2017; Jacobides *et al.*, 2018; Jacobides, 2019; Iansiti and Lakhani, 2020).

Yet, this power also raises questions. Today's corporate giants sit at the center of powerful *multiproduct* webs that drive customer lock-in (Stigler Report, 2020)—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 *multiactor* ecosystems that allow them to leverage their complementors (Hagiu and 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 (Iansiti and Lakhani, 2017, 2020; Cusumano *et al.*, 2019) and exploit the “bottlenecks” that emerge in these new industry architectures (Jacobides *et al.*, 2006, Baldwin, 2018, 2021). 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). Worryingly, our existing regulatory apparatus is ill equipped to tackle, or even identify, the issues that they raise (Jenny, 2021).

Some voices have been raised against these dominant actors. Reports published in 2019 in the UK (Furman Report, 2019), the European Union (EU) (Crémer *et al.*, 2019), the USA (Stigler Report, 2020), and Brazil, Russia, India, China, South Africa (BRICS) (Lianos and Ivanov, 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, who leverage their roles as ecosystem orchestrators to wield power that evades today's regulatory apparatus.

This paper provides an in-depth analysis of ecosystems, starting with a discussion of what ecosystems are and the competition issues they raise. We then consider the regulatory gap in addressing their power and review the means to address issues of dominance, which include stretching our existing tools in the context of ecosystems; devising new *ex ante* tools; and enhancing *ex post* ecosystem regulation. We pay particular attention to issues relating to business models and the architecture of ecosystems and also review, by way of a case study, the recent Greek competition law proposal for an *ex post* tool that can complement *ex ante* efforts such as those discussed in the EU.

2. Understanding ecosystems: framing observations

The concept of ecosystems has gained significant traction as a distinct organizational form. In a Boston Consulting Group (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 (Moore, 1993; Iansiti and Levien, 2004; Teece, 2007). The concept reflects the emergence of business environments marked by modularity in production, coevolution, and decisional complexity, where innovation must be coordinated across different hierarchies, markets, and industries (Baldwin and 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 goods, services, or solutions, that coevolve 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).¹

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, although, 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 about interorganizational relations (Jacobides *et al.*, 2020). Ecosystems, which often draw on platforms, arise not from centralized control but from the interactions between the components of a correlated system (Siegenfeld and Bar-Yam, 2020). Ecosystems refer to *multiactor* groups of collaborating complementors (i.e., “theory of the firm” alternatives to vertical integration or supply-chain arrangements) and *multiproduct* bundles offered to customers (i.e., horizontally or diagonally connected goods and services that are “packaged” together), focused on customer ease—and lock-in (Jacobides *et al.*, 2021).

Ecosystems often compete with each other, as the Apple and Android (Google) smartphone ecosystems illustrate. Such *interecosystem competition* emphasizes substitutability (Crane, 2019), mostly between *multiproduct* ecosystems. However, since ecosystems also rest on interactions between independent firms, multiactor 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).² Vertical intra-ecosystem competition falls in a blind spot of existing competition law (Lianos, 2019b) yet is at the core of contemporary concerns with platform orchestrators: Are, for instance, Apple’s 30% fee from apps purchased on its app store and, more importantly, its ban of within-app purchase standard commercial practices that we do not need to be concerned with or are they expressions of abuse of its complementors not only small but also large (Jacobides, 2021)?

Some authors (e.g., Petit and Teece, 2021) are fairly relaxed about *both* interecosystem and intraecosystem competition issues, considering that the digital environment is inherently competitive, driven as it is by innovation and potential competition as opposed to “naked monopoly rents.” They are concerned that the neglect of dynamic factors and the emphasis on well-delineated markets gives us the wrong tools, which make us, if anything, *too* concerned with competition. Significant turbulence, they argue, makes dominance transient and rents Schumpeterian—i.e., ultimately erodible. This argument is reminiscent of the contestable market theory of Baumol 30 years ago (Baumol, 1982, Baumol *et al.*, 1982), which has received its fair share of criticism (Dixit, 1982; Shepherd, 1984), as it holds that the sheer presence of potential (interecosystem) competition economic performance will induce competition and lead to an efficient outcome.³ This also suggests that we should not worry about extraordinary profits or try to contain competitive behavior. Success, they reckon, is due to extraordinary dynamic capabilities, so we should not mistake extraordinary profits for competitive dominance. This raises an interesting conundrum. While competition might shift to dynamics, there is nothing to assuage us that dominant firms will not abuse their power to forestall competition. As Crawford *et al.* (2021) demonstrate, contestability does not spontaneously emerge; firms, left to their own device, may well try to innovate in ways that increase their “moats” and ability to lock in customers and exclude competitors in the future, so the reliance on dynamics is no guarantee of a competitive outcome. Rather, they conclude, regulators should proactively try to ensure firms

1 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., Becattini, 2002). Additional reviews have been offered by Kapoor (2018), Bogers *et al.* (2019), and Baldwin (2021), discussing how ecosystem research relates to other streams in strategy and innovation.

2 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 broaden 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).

3 Note that the contestable markets theory is based on a fairly heroic set of assumptions, such as the lack of material sunk costs, which is at odds with reality in network settings and capital-intensive and fixed-cost heavy settings.

act and innovate in a way that can maintain the contestability of an ecosystem (interecosystem competition) as well as ensure that orchestrators do not abuse their position in terms of intra-ecosystem competition. Contestability should be baked into regulatory requirements and scrutiny.

As [Jenny \(2021\)](#) shows, Facebook's acquisitions of WhatsApp and Instagram were not only motivated by the desire to integrate capabilities; they aimed to eliminate a potential competitor that threatened to unseat a dominant player. Mergers and Acquisitions (M&A) of technology firms, explored by [Parker et al. \(2021\)](#), have multiple motivations, and competitive dominance is one of them. Undue advantage can be achieved through dynamic means: building up knowledge potential, shaping trajectories of technology development, and constraining members of an ecosystem through technological lock-in, and the establishment of integrative routines may considerably increase the power of ecosystem orchestrators to reap benefits that reinforce their ability to leverage their ecosystem, as discussed by [Helfat and Raubitschek \(2018\)](#).⁴ Their dominance may have grown so much that, as [Kwoka and Valletti \(2021\)](#) argue, regulators should be able to contemplate breaking firms up as a *refugium ultimum*.

Today's ecosystem orchestrators also leverage the data that are generated by their ecosystem to target individual customers and customize their offerings, as well as learn what works best and yields most with the help of AI and constant A/B testing ([Athey and Luca, 2019](#)), threatening to give them an insurmountable advantage ([Crawford et al., 2021](#)). This dominance may become ever more pronounced when privacy issues reduce data access to partners, leading to competition concerns ([Kira et al., 2021](#)), as in the recent example of Apple's iOS 14, where privacy concerns were used by Apple to build dominance in the mobile advertising space ([Sokol and Zhu, 2021](#)). As [Parker et al. \(2021\)](#) note, data underpin much digital M&A so much so that they propose, as a means to address anticompetitive mergers, to oblige *in situ* data access.

The evidence on dominance over the last few years has been sobering as a handful of players have cemented their position at the top of most segments while, at the same time, broadening their scope. In terms of market capitalization, the same five firms in the USA (Apple, Google, Microsoft, Amazon, and Facebook) and two in China (Tencent and Alibaba) top the list. These firms have also markedly increased their absolute value and continued to gain ground over other incumbent firms, showing that the markets' view of dynamic dominance is clear. For all the rhetoric of disruption, there seems to be significant and hardening stratification. It takes an act of faith to assume away competitive dominance. Rather, we argue, we need to take dynamics seriously in considering the conditions under which competition is challenged and create the tools to assess and, where appropriate, intervene.

The focus of ecosystem firms on growth and their reliance on capital markets makes much of the traditional framing and tools ineffective. The financialization of the economy, i.e., the availability of capital for ambitious ecosystem firms and its use to motivate executives, if anything, exacerbates the problem. Furthermore, equity market valuations of ecosystem orchestrators imply both massive growth rates and increase in margins themselves potentially due to their *expected* dominance. The impact of the recent regulatory surge in China ([Smithurst, 2021](#)) on the valuation of Chinese tech giants such as Ant Financial, Didi, and digital education giant TAL Education illustrates the effect of regulation on future profits, over and above dynamic capabilities.⁵ So, what do we know about intraecosystem and interecosystem dynamics?

Starting with interecosystem competition, we know that Big Tech firms accommodate each other as much as they compete: the fact that Google has been paying Apple over \$10 billion per annum for "Traffic Acquisition Costs" for its browser to be embedded in Apple's software suggests a symbiotic relationship (see [Jacobides, 2020](#)). Each of the Big Tech firms has a distinct business model, and these are not in direct competition ([Caffarra et al., 2020](#)). [Scott Morton](#)

4 As [Helfat and Raubitschek \(2018\)](#) note, "although integrative capabilities cannot fully insulate platform leaders from the threat of innovative competition, they can help to build stronger cross-side network effects that may help defend against such threats." The challenge here is that the strategy literature does not consider directly whether such integrative capabilities, which might create consumer benefits, also undermine competition, although they note that they are particularly useful for *appropriating* value.

5 Conversely, the fact that EU regulation activity and the shifting mood in the USA are yet to affect Big Tech market capitalization may be an indication of the market expectation that such issues will be brushed aside by the growing army of lobbyists and friends of Big Tech in the policy and academic community.

and Athey (2021) show how platform orchestrators acquire other platforms to reduce risks of competitive challenge. And while corporate expansion may eventually lead to more competition, we should not assume that such competition is fierce; most tech firms try to shape their own market rather than compete in existing segments (Jacobides *et al.*, 2006). As Crawford *et al.* (2021) detail, digital markets dominated by ecosystem orchestrators are scarcely contestable, and, more to the point, policy should be expressly devised to make them contestable—something that is unlikely to happen unaided in the digital ecosystem context.

Evidence is more disconcerting yet when it comes to intraecosystem competition. As Rietveld *et al.* (2020) show, ecosystem orchestrators tend to be open to and supportive of complementors as their ecosystems gather pace but change their policies and become significantly more exploitative over time, raising serious issues of competitive abuse. As Crawford *et al.* (2021) and Lianos (2019b) explain, fairness with regards to surplus sharing is an important concern that should be explicitly taken into account in the regulations currently under discussion.

Interecosystem and intraecosystem competition are jointly important for consumer welfare and innovation: the fiercer the interecosystem competition, the less problematic a reduction in intraecosystem competition;⁶ the weaker the interecosystem competition, the more likely that intraecosystem competition will be distorted, as this affords orchestrators the opportunity to entrench their dominance. That said, the extent to which interecosystem competition can ensure intraecosystem competition depends on structural attributes, for instance, the presence of gatekeepers (see Jacobides, 2021). Although we are in agreement with Petit and Teece (2021) that competition for future rents may discipline monopoly power and provide incentives for investment and output growth, one should not underestimate the disciplining effect of *actual* competition, as perceptions about the actual and future competitive positioning of digital giants, for both interecosystem and intraecosystem competition, are *actualized* and *monetized* through asset valuation in financial markets. The distinction between static and dynamic competition is not straightforward in a financialized economy.

Ecosystems may become sources of significant distributed innovation and creativity through economies of scale and specialization (Grundlach, 2006). However, nongeneric complementarities could also enable dominant actors in ecosystems to exploit locked-in complementors or final consumers.⁷ Competitive analysis of such contexts is delicate, as it is hard to assess the true prices involved—a common challenge for multisided platforms (MSPs), which underpin many ecosystems. MSPs link ecosystem participants such as advertisers and website visitors, where zero-price goods for the final consumer (such as free storage or email) are subsidized by ad revenue. Thus, while final customers may be happy with the “free” product, orchestrators may intrude on them in nonmonetary ways (through advertising) and may be squeezing their complementors too (Jacobides *et al.*, 2020: 13).

Ecosystem orchestrators make strategic use of their 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 information.⁸ For instance, Facebook and Google allow complementors to connect to their platforms

6 If the number of competing ecosystems is small and they are symmetrical, a strong intra-ecosystem competition may better preserve the interests of complementors and final users. This approach is close to that followed for interbrand and intrabrand competition in EU competition law: see European Commission (2010), para. 102.

7 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 *nongeneric 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 orchestrators can abuse their position of strength, a point also developed by Biggar and Heimler (2021). While unique complementarities are not new to competition law (issues of power along value chains have been addressed, e.g., by Lianos and Carballa-Schmischowski [2020]), supermodular complementarities (which underpin network externalities) are harder to tackle. On the related network externalities issue, see Economides (1996).

8 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

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 hypertargeted 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 “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 and 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, 2021) when platforms provide irreplaceable access to consumers. This power is even greater if users cannot easily multihome (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 multihome across platforms. This becomes all the more salient when ecosystem orchestrators can turn themselves into a “default” for customers, making them difficult to dislodge.⁹

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.

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 focuses on consumer welfare (Werden, 1992) and also include innovation. However, with the emergence of multiproduct and multiactor ecosystems and platforms that span multiple economic activities, this concept

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 (November 11, 2018), available at http://ec.europa.eu/competition/mergers/cases/decisions/m8788_1279_3.pdf, para. 200.

⁹ 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 (multiproduct) 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 do not

Platforms	Platforms provide the technical and institutional infrastructure for enabling the collaboration of different entities. Some, such as multisided platforms or multisided 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, e.g., 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 nondigital core platform services, but these are not covered by the DMA.
Ecosystems (multiactor)	Multiactor ecosystems are groups of independent actors that collaborate through nongeneric complementarities for the provision of a collectively produced product or service or bundle of products and services.
Ecosystems (multiproduct)	Multiproduct 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 multiproduct or multiactor 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 nonhierarchical governance in block-chain 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 imposes obstacles on user multihoming or switching platforms (or ecosystems) ^a . 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. ^b

^aNote that the DMA does not specify that gatekeepers orchestrate ecosystems.^bFor an alternative definition of gatekeepers, which focuses on structural features, see [Jacobides \(2021\)](#).

is no longer adequate to reflect the new reality and has been considerably stretched in order to take into account the effects of competitive strategies at the ecosystem level.

The “relevant market” framework does not fully take into account the actual or likely effects of an undertaking’s leveraging its dominance in one relevant market to related markets in the same ecosystem. As previous scholars have noted, “families” of closely related products creating systems competition (Katz and Shapiro, 1994) increase the costs imposed on new entrants, who must create a competing family or cooperate 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 the 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. In these cases, the competition authority will have to define two separate relevant markets—one where the undertaking is dominant and the other on which the effects of the abuse are felt—and establish some causal connection between the two markets when it assesses the existence and extent of abuse.

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 (so-called “after-markets”) (Shapiro, 1994). 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 broadly.¹⁰ Here again, we can define a narrow relevant market for the primary product, potentially down to a specific brand (CJEU, Hugin, 1978; CJEU, Renault, 1988; US Supreme Court, Kodak, 1992). Provided an undertaking is found to be dominant in the focal market, antitrust authorities consider the secondary (after)markets, which is where the specific conduct’s effects on consumers are mostly felt. It, therefore, appears that when we are concerned with the welfare effects on one set of final consumers, the competition problem is usually simple enough to be solved with the traditional relevant market framework in competition law.

The concept of “relevant market” faces more 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 multisided 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 and 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

¹⁰ 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.

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” (Newman, 2019; Evans, 2020) 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 multisided 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 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 becomes perilously distant from the reality of real-world power (Siegenfeld and 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 multiproduct and multiactor 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 multiactor 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 nongeneric complementarity) lock-in, this view, developed in particular after the landmark Kodak decision of 1992,¹¹ could help provide some guidance as effects on the primary market and/or the aftermarket affected the same category of users. However, the aftermarket perspective does not cover all the types of lock-in engendered by MSPs, 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

11 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.

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	Multisided platforms	Interecosystem Intraecosystem (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	Multisided platforms	Interecosystem	Narrow relevant market with consideration of out-of-market efficiencies (EU) or broad relevant market (USA) Ecosystem analysis; abuse wrt complementors
Digital ecosystems	Search engine-based, multiproduct scope (Google) Social network-based, multi-product scope (Facebook) Device- and S/W-based multiproduct scope (Apple) eCommerce-based, multiproduct scope (Amazon) Future 5G Internet of Things platform based (e.g., connected cars)	Final users (locked in both for each product/service and bundle) Complementors in each of the multiactor ecosystems operated Future users and complementors	Nongeneric 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 => <i>de facto</i> entrant discrimination	Multiproduct and multiactor ecosystems, supported by (potentially connected) multiside platforms and attention markets	Interecosystem 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 <i>ex ante/post</i>

(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 nongeneric cospecialization 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 multiproduct ecosystem that leads to competition problems rather than dominance in any particular market (Jenny, 2021).

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 simultaneously.¹² This led to different approaches regarding market definition in the EU and in the USA regarding transaction (matching) platforms.

The engagement with transaction platforms from regulators, useful as it is, still does not fully capture the complexity of competitive interactions that emerge in ecosystems that are based on advertising-based multisided 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 nonmonetary dominance in another field (search or social media), and they use multiproduct 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.¹³

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). These 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 these 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 *multiproduct and multiactor ecosystem* can dominate. It can impose its own ad-tech services as it becomes more multiproduct than before. It can restrict customer choice, as the social media lock-in means users do not 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.

Actors with a central position in an ecosystem can potentially leverage their relationship with the final customer, unduly restricting access, choice, or innovation. They can also monetize the

12 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).

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

knowledge they gain about consumer preferences from consumer Internet usage, 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.¹⁴ The motives and the ability to exercise such power depend, in turn, on the *business model* and the *architecture and governance of the ecosystem*.¹⁵

In particular, we argue that to assess power and dominance, we need to focus on the dual topic of actors' business models (Caffarra and Scott Morton, 2021b; CMA, 2020) and ecosystem architecture and governance, which are underexplored and often misunderstood topics.¹⁶ 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; our expectation is that, far from *chilling* innovation, a stronger regulatory hand would *enable* innovation, which may be curtailed by dominant orchestrators who either suppress it or limit innovation to what is consistent with their own suite of offerings.¹⁷ Regulatory policy in ecosystems should be more explicitly focused on the costs and benefits of intervening on innovation itself, and competition authorities should take a more dynamic perspective on the situation.¹⁸

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

15 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 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).

16 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 "ecosystem governance." They correspond to what Caffara, Scott Morton, Athey, etc. referred to as "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 Jansen *et al.*, 2019) defines who is allowed to compete in a (multiactor) 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 that 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 favor of (at least some) self-regulation, Cusumano *et al.* (2021).

17 In the policy debate, firms facing regulation often argue that it may stall innovation. This is more often than not a slight of hand. It might reduce *their* innovation, or innovation by *their* partners, and make particular bundles of service more difficult, but this is done to promote competition but also *other* innovation, which might not take hold without regulatory intervention. This point is made forcefully from the emerging work on the potentially deleterious effects of M&A on competition and innovation—including "killer acquisitions," which demonstrate the anticompetitive motivations of dominant firms' acquisitive behaviour and the potential value-add of regulatory intervention to *enhance* innovation; see Cunningham *et al.* (2020) and Petropoulos *et al.* (2021).

18 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 and Greenstein's (1999) observation 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).

Taking a dynamic, proactive approach is justified by the nonlinearity of complex digital markets, where relatively new firms can become industry leaders in a short period of time through network effects, rapid scale-up, learning effects, and market tipping (Varian, 2019). The issue is that the traditional tools to assess dominance are relatively static and do not account well for the nature of dominance and the concomitant dynamics of digital platforms and the ecosystems they spawn. Take, for instance, Apple. While it controls a market share of a little less than 17% for smartphone devices globally, being placed second after Samsung, it accounts for 42% of the global smartphone revenue in 2021.¹⁹ More to the point, as most consumers only have *one* smartphone, and where they are embedded in the Apple ecosystem through a set of products and services that reinforce each other (Apple TV, iPods, iPads, wearables, and iMovies, iTunes, etc.), they find it hard to choose a different one and they are open to being exploited. Even more consequentially, even large players, such as, say, dating apps like Tinder have no choice but to participate in the Apple ecosystem, notwithstanding exorbitant fees that may hurt both them and their customers. Not doing so would undermine their ability to offer the right match: Apple has a hold on iPhone users that allows it to dominate both end users and complementors, such as Tinder and Match.com, whatever their size (see Jacobides, 2021, for a detailed analysis).

The issue with the traditional metrics is that based on market share, competition authorities would be unable to judge Apple dominant in smartphones unless it chose to focus on a bottleneck aspect of Apple's ecosystem, such as the OS or the App Store, that could be defined as a separate market from the rest of Apple's functionalities (e.g., iTunes, Apple Pay, iMovie, iBookstore, and iWatch). The existing framework would thus require a narrow focus to confirm dominance under Article 102 Treaty on the Functioning of the European Union (TFEU) (on abuse of a dominant position) (European Commission, 2021)—which would miss the nature of competitive dominance that a powerful ecosystem orchestrator/gatekeeper enjoys. The problem, of course, persists, and common sense has led to a more creative, if inconsistent reinterpretation of existing tools. To wit, some jurisdictions have chosen to rely on specific competition law statutes that sanction the abuse of the kind of economic dependency that Apple imposes on its premium distributors (Autorité de la Concurrence, 2020). While offering an ad hoc remedy, however, these solutions do not provide a direct assessment of the anticompetitive effects at the level of the Apple ecosystem, which we think should be addressed head-on. The underlying challenge is that the current framework fails to offer a coherent approach to situations of lock-in that result from the power exercised by actors with a central position in an ecosystem of paramount importance, such as Apple, when they face only limited competition from very few other players/ecosystems. We propose to address this, especially, in conditions of limited interecosystem competition, which renders intraecosystem competition vital for competition, consumer welfare, and innovation.

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 (EC) has already recognized the importance of ecosystem competition. The EC noted that in view of the integration of Google Play Library Services

¹⁹ See https://www.phonearena.com/news/apple-iphone-account-for-almost-half-global-smartphone-revenue-aq1-2021_id131821.

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 clauses.²⁰ 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 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 analyzed separately, alongside competition on (possible) markets for digital ecosystems” (Crémer *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 an actor with a central position 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 (Crémer *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 multiactor ecosystems.

In the absence of a 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, the market definition focuses on substitutability, and the metric used to measure market power—market share—does not account well for the issues raised by intraecosystem 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 multisided 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 and 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.

20 An MFN clause—also called a “most favored customer” (MFC) or antidiscrimination 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.

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 the dynamics of competition. Teece and Coleman (1998) and, more recently, Petit and Teece (2021) 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 that 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 “mologopoly 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 seem at odds with the facts. 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 *intraecosystem* competition. As such, we believe that approaches of this sort tend to assume (or wish) the problem away rather than addressing it.

An additional challenge is that ecosystems are prone to market tipping. One example is the Internet of Things, where we may observe the emergence of “dominant digital ecosystems and gatekeepers.” A patchwork of ad hoc solutions has 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 (Crémer *et al.*, 2019), 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, and fairness) and economic (price, innovation, and equality of opportunity). In this regard, the nascent European regulatory framework focuses on digital platforms (European Commission, 2020a,b,c), and one of its goals is to ensure sufficient *intraecosystem* competition, with the aim of protecting complementors. This may address the *multiactor* ecosystem context as a means to alleviate *intraecosystem* competition issues.

One possibility would be to address any exploitation of complementors directly by mandating the desired “fair” results (e.g., prices and 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 centers 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 nonprice 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 and Lianos, 2019; Condorelli and 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 *et al.*, 2019 for a hard law approach) and implemented in some jurisdictions (e.g., Japan²¹).

In the EU, a first round of regulation culminated with the adoption in 2019 of Regulation 2019/1150²² (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 services²³ 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, 2020) and thus does not cover the “uncontract” situation that structures most interactions within ecosystems (Zuboff, 2019: 208; Lianos and 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 (European Commission, 2020b Digital Services Act²⁴), and regulatory instruments for gatekeepers in the EU (European Commission, 2020c Digital Markets Act [DMA]²⁵). Inspired by

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

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

23 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.

24 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).

25 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).

the narrative of openness, the DMA proposal draws on the 1990s effort to open up telecoms access through “asymmetric regulation” (Alexiadis and de Streel, 2020). The idea is to place *ex ante* regulatory obligations on undertakings that enjoy “significant market power” (European Commission, 2018²⁶), but the reliance on the concept of “relevant market” in the telecoms regulatory framework raises the limitations explained in Section 4.1.²⁷

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 European Commission, 2020c; 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 limited case-by-case assessment even if a platform does not meet the thresholds above, on criteria including size (turnover, market capitalization, and operations)²⁸ and user numbers²⁹—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 *multiproduct* or *multiactor* ecosystems.

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.” This may arguably reduce the flexibility needed to assess complex schemes and business models that are not well understood (Jenny, 2021; Lianos, 2019c), that flexibility being a considerable advantage of the competition law tool and its ability to take into account possible efficiencies when determining the legality of a specific kind of conduct. However, the proposed regulatory scheme is also inspired by the coregulation/regulatory dialogue or “participatory” approach put forward by some academics (Tirole, 2019) or industry players (Bethel *et al.*, 2020) as a solution to the informational asymmetry of the regulators of digital platforms (Tirole, 2019), particularly in the context of “anticipatory regulation”.

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 and Scott Morton, 2021a). Although the Commission and the preparatory experts’ reports (CERRE, 2020) often mention “ecosystems,³⁰” 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 platforms,³¹ this is not the case for Uber or Deliveroo, among others.³² 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 are specific regulations at

26 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.

27 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.

28 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.

29 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.

30 Recitals 3 and 14 of the DMA Proposal.

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

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

the EU level.³³ Third, the regulation does not cover 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 nonconventional *ex post* competition law framework. We turn to this next.

4.3 Nonconventional *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 USA. Be that as it may, despite the recent effort to harmonize competition law enforcement in the EU,³⁴ member states have maintained flexibility over implementing national competition law (Monti, 2019). This has usually been through some form of *ex post* enforcement against nonstructural 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 ecosystems.³⁵ Elsewhere, recently proposed Belgian competition legislation deals with the abuse of a relationship of economic dependence. Justifying this law, Belgian legislators made specific reference to the legislative gap concerning digital platforms.³⁶ French competition authorities have applied provisions for the abuse of economic dependence—which form part of their rulebook on free and fair competition³⁷—to nondominant firms in a market.³⁸ This shows that national legislators favor provisions that apply *ex post* and afford greater flexibility than a formal regulation.

Although these nonconventional 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

33 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 April 29, 2015, 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 (2020c) 592 final.

34 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 December 11, 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.

35 See, 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.

36 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/changelg.pl?language=fr&la=F&cn=2019040453&table_name=loi.

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

38 Case 20-D-March 4, 2016, 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.

products.³⁹ The concept has been compared to that of “intermediation power” in the EU Digital Reports (Crémer *et al.*, 2019).

As a (so far) 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 practices⁴⁰ providing the BKA with 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 behavior 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 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 multiproduct ecosystem and exploit independent firms that are connected through multiactor ecosystems that demand some nongeneric 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 *firm-specific* 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 generated, which corresponds to what the Competition and Markets Authority (CMA) considers in its analysis as well.⁴¹ That is, we suggest that we

39 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.

40 See, Article 19a of the German Competition Act, introduced by the 10th amendment to the German Act against Restraints of Competition.

41 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,

should “follow the money,” mapping what drives profits in the ecosystem and what might lead to dominance. More importantly, 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 more loosely as “business models” (Caffarra *et al.*, 2020; Caffarra and Scott Morton, 2021a), as well as the governance of multiactor ecosystems—the rules of engagement between the different parties (see Jansen *et al.*, 2019, on software ecosystems, for an analogy).

Understanding business models and ecosystem architectures shine 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 helps it generate ad revenues as a result of the operating principles of its ecosystem.⁴² 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 importantly, 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 multiproduct, mutually compatible suite of offerings (iPhone, iTunes, etc.), whereas other platforms like Uber and Lyft do not have such a hold on customers.⁴³ 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 match-making 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 directions); (c) the *potential for multihoming* (on one or both sides), and (as emphasized 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 (on the basis of the literature) a bit of 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).

One final aspect of regulation in platforms and ecosystems relates to self-regulation, discussed by Cusumano *et al.* (2021). The idea of self-regulation has a long pedigree, with its strengths and weaknesses clearly visible in settings such as movie ratings or airline reservation systems, where an unsupervised operation might either undermine the legitimization of the product itself

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 and 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 and McLean, 2021.

42 See, 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 customized offers and being locked in—and Big Tech know exactly how to walk it.

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

(as in the case of movies, whose varying content may confuse buyers and their families) or lead to blatantly unfair surplus distribution practices (such as reservation systems, which favored some airlines over others). The benefit of self-regulation is that it allows for complex settings to be effectively regulated from within, drawing on insiders' knowledge to create codes of conduct or even mandate architectures and prescribe specific roles. The downside, of course, is that they are driven by insiders and their interests. The main driver for such regulation is the “tragedy of the commons” (Hardin, 1968) that would emerge absent such self-regulation. In concrete business terms, the inasmuch as the “tragedy” (for all firms) of customers walking away from the product is averted due to lock-in, it may need to be substituted by a different but equally motivating “tragedy,” which can be the threat of robust, perhaps blunt regulatory action. This is what focuses the minds for thorough self-regulation. As Kwoka and Valletti (2021) note for the role of dominant firms, regulators need to have the threat of blunt tools even if they are not used directly. So we view such self-regulation as a valuable complement and not a substitute of *ex ante* and *ex post* regulation.

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* approaches and can also be complemented by self-regulation. Many of the *ex ante* regulations, such as those put forth by the Digital Services Act (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.⁴⁴

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 CMA promotes a code of conduct adapted to each firm's business model in action and to the industry architecture overall.⁴⁵ 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 and de Francheschi, 2020). It is also consistent with a greater focus on governance at the level of ecosystems (Jansen *et al.*, 2019).⁴⁶ 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.

44 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.

45 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).”

46 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 underpin the governance of the interorganizational 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*.

5. Breaking new ground: the Greek proposal and its rationale as a case study

A 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 Competition Commission could prohibit an undertaking holding a central 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” 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 central 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” adjusted to the field of ecosystems as a “central position,” which is defined, as is the case for the concept of dominance, as “a position of economic strength” enjoyed by an undertaking and used 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 detriment.”⁴⁷ 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 different actors could not usually be qualified as competitive but rather as partly competitive and partly cooperative, relating as they do not only to a horizontal but also to a vertical or conglomerate dimension. 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” and “central position.” A specific paragraph defines the concept of “ecosystem” as “a web of interconnected and largely interdependent economic activities carried out by different undertakings with the 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.” A platform is defined as an entity that operates either as an intermediary for transactions between interdependent groups of end users and business users or between interdependent groups of business users or as infrastructure for the development and provision of different, yet interconnected, products or services.

The two dimensions of the definition of an “ecosystem” cover both multiproduct and multiactor 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 and 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 economical 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.

⁴⁷ See, for the seminal definition, Case C- 271/ 76, *United Brands company and United Brands Continental v Commission* [1978] ECR 207, paras 65, 113; and Case C- 851/ 76, *Hoffman- La Roche & Co v Commission* [1979] ECR 461, paras 38–39.

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 anticompetitive 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.

An ecosystem is presumed to be of paramount importance to competition where failure to participate in it substantially affects the effective exercise by third parties of their economic activities. When determining an ecosystem’s structural importance to competition, account is to be taken particularly of the following elements: (i) the economic power of the ecosystem or its significant share in the turnover or the revenue of one or more sectors of the Greek economy, (ii) its access to substantial resources, in particular, to a significant number of business users that depend on the ecosystem in order to connect with end users or to sensitive data and information about the competition, and (iii) the significance of its activities with regard to the access of third parties to procurement and sales markets in the Greek territory.

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.⁴⁸ The pragmatic motivation is that there exist various large ecosystems beyond Big Tech that may have a significant impact on the Greek economy, as platforms and ecosystems in tourism and hospitality. There is also the consideration that agrotech or fintech, although falling outside the gatekeeper regulation, could still in the absence of viable alternatives for complementors impact a broad swathe of the Greek economy.

However, the law puts forward the concept of “central position” in an ecosystem as the trigger for competition law intervention to make clear the distinction with that of “dominance,” assessed at the level of a relevant market. It is also provided that when determining the possession by an undertaking of a central position in an ecosystem, account shall be taken, *inter alia*, of the following elements: (i) the control by that undertaking of resources and infrastructures necessary for the economic activity of other undertakings, (ii) the undertaking’s ability to set out rules governing the operation of the ecosystem and the access of third parties to it, (iii) the undertaking’s increased bargaining power *vis-a-vis* business users and end users of the ecosystem, and (iv) the dependency of ecosystem users on the undertaking for the provision of intermediation services essential for their access to markets for products and services and the absence of a credible alternative.

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.

The specific provision serves three main goals. First, it aims to complement the DMA framework and provide the Competition Commission with the tools to tackle the abuse of ecosystem

48 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.

power by business entities that may fall outside the gatekeeper criteria set by Article 3 of the DMA but, at the same time, are central actors in important ecosystems for the Greek economy. This would seem to apply to platforms such as Airbnb, Booking.com, and Expedia, which hold sway over a significant part of the short-term rental or hotel accommodation sector in the country, even if they do not necessarily hold a dominant position on a specific relevant product or geographic market or satisfy the Article 3 DMA criteria for gatekeepers. Given that tourism contributes approximately 25% of Greek GDP, the effects of anticompetitive practices on the economy and, in particular, their distributive impact may be significant.

Second, the provision may add weight to a broader agenda: that of opening up closed ecosystems that emerged from substantial public investments aimed at creating platforms that would enable Greece to develop new economic activities, manage its digital transition, or even establish national champions. Some of the economic entities established in this way were privatized former state monopolies that orchestrated important ecosystems for the Greek economy without necessarily holding a dominant position in an antitrust-relevant market. These entities possess technological or positional advantages resulting from public investments or exclusive rights inherited from their period as state monopolies—advantages that they may seek to leverage by reproducing the closed ecosystem architecture in other economic activities or sectors of the economy, thus reducing competition and innovation.

Third, the provision also aims at smaller, positional monopolies, often emerging out of some form of state intervention that have created ecosystems through which they exercise power over sectors that will have an important bearing on digital and green transition of the economy. It provides a surgical tool for structural deficiencies and rent-seeking.

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 economy.⁴⁹ 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 toward 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.

First, 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. First, 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. Second, by emphasizing that the ecosystem must be of paramount importance, the provision takes into account the degree of interecosystem or interbrand 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. Interecosystem 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 and Regibeau, 1988). More interecosystem competition may thus compensate for less intraecosystem competition. This implies that the competition authority must investigate whether there is enough interecosystem 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 interecosystem 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

49 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.

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 intraecosystem competition may not be compensated by more intensive interecosystem competition, in particular, if the specific conduct forms part of a leveraging strategy to suppress competition, at both the intraecosystem and interecosystem levels (see, for instance, Choi and Stefanadis, 2001 for bundling and Eisenmann *et al.*, 2011 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 intraecosystem competition will not produce significant negative welfare effects in this context. In order to promote legal certainty, the provision establishes a safe harbor 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 central position in the particular ecosystem. The concept is conceptually close to that of “dominance” in Article 102 TFEU, which focuses on “the power of independent behaviour [of the undertaking].” However, the parameters used to measure centrality 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 and Carballa-Schmichowski, 2020).

Third, in order to enhance legal certainty, it is acknowledged in the explanatory text for the law that, in principle, the provision aims to serve as a tool to open closed ecosystems/sectors from the anticompetitive conduct of former state monopolies and firms with exclusive rights that benefitted from past public investments to develop ecosystems that locked in a number of business actors. It also serves to regulate the power of large (primarily but not exclusively) digital platforms, particularly when the global turnover of the undertaking being investigated is more than €300 million.

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. 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 interproduct 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 the 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. Finally, it becomes important to integrate such national initiatives in the broader framework of digital regulation emerging from Brussels. In practice, national competition authorities in smaller economies may find it hard to achieve results without at least some form of cooperation with other jurisdictions or, in addition to the EU framework, with regard to BigTech platforms that may qualify as gatekeepers. What exactly will transpire with this proposal is currently unclear, but its fate will probably be a stark reminder of the role that political economy plays in this context.⁵⁰

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 (well founded 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 instruments.⁵¹

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⁵⁰ 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.

⁵¹ 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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