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A Law and Political Economy Approach to Ecosystems and Competition Law

Ioannis Lianos*

This short paper examines the emergence of the concept of ecosystems in competition law in recent years. This is not a linear process, and a competition law and policy theory of ecosystems is still in the making. The recent more systematic use of the concept in competition law proceedings nevertheless provides some clues as to the possible development of this concept and the effort of conceptual clarification that needs to occur. I explore the business studies underpinnings of this concept and the relatively limited analysis by Industrial Organization economics of business ecosystems and co-opetition. I argue for a legal theory of ecosystems that would engage with the goals of the specific competition law or regulatory system while relying on other areas of learning than economics, such as advanced social network analysis and computational sociology to make sense of ecosystems' dynamics. A broader law and political economy perspective will also enable public authorities to understand better the power relations within or outside a specific business ecosystem and to think creatively about remedies to competition law-related ecosystem problems, that unlock social value and may thus benefit all ecosystem stakeholders, but also the public interest at large.

I. INTRODUCTION: THE EMERGENCE OF THE ECOSYSTEM CONCEPT

As computer networks, in particular since the 1970s, enable economic actors to collaborate in real-time from a distance, and modularity became a feature of economic organization,¹ business strategy moved from the internal focus of organizing production to develop performant products to the external focus of constituting a large outside supportive network of cooperation, the business ecosystem. Already in the early 2000s, sociologists Luc Boltanski and Eve Chiapello have called attention to the emergence of a “connexionist” world founded “on the mediating activity employed in the creation of networks,” as the objective pursued by business strategy becomes the creation and expansion of networks, “independent of the goals pursued or the substantive properties of the entities between which the mediation is conducted.”² Mediation becomes “a value in itself,” and establishing business networks is the essence of economic interaction. In a “connexionist” world, the game is to “multiplying

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¹ C. Y. Baldwin, “Ecosystems and Complementarity” Harvard Business School Working Paper (August 2020).

² L. Boltanski & E. Chiapello, *The New Spirit of Capitalism* (Verso, 2007), 107.

connections and proliferating links, the succession of projects” having the effect of “extending networks,”³ this by itself generates market “value.”

Whereas competition plays a crucial role in markets, relationships in a “connexionist” world are characterized by a mixture of simultaneous cooperation and competition between those affiliated with the network. In these relations of “co-opetition,”⁴ independent firms are linked operationally across multiple tiers in a network, in which they compete (for the attention of or to the benefit of a third party), but also simultaneously cooperate to fulfill a common set of tasks increasing the value of the network.⁵ This places the entities in question in a “paradoxical” situation. These more complex systems cannot be adequately accounted for by the market concept, in which relations can be either competitive or cooperative, in what looks like the digital analog of the binary choice of using a discrete value of either zero (0) *or* one (1). They require instead a conceptualization of the field of strategic action through a more quantum computing-like lens, allowing to hold a value of both zero (0) *and* one (1), to the extent that the system is characterized by simultaneous and/or sequential competition *and* cooperation. The concept of business ecosystem has been used to describe this complex setting and to account for a system of actors that entertain relations of co-opetition with each other.⁶

Ecosystems are constituted by directly interdependent economic agents (most often in oligopoly structures) striving to adapt through governance regimes (institutions) to the situation of strategic uncertainty generated by the great complexity of the linkages and relations between them (complex adaptive systems). The members of an ecosystem, although independent firms, are not solely relying on the price system to coordinate economic activities (as independent firms do in a de-centralized market), but use instead prices “in conjunction with bilateral contracts, multi-lateral negotiations, and [technical] platforms.”⁷ The dispersed knowledge system and the dominance of a logic of individual profit maximization are thus replaced by a coordinated knowledge system and a focus on ecosystemic or community profit maximization. This has led some authors to argue that “(e)cosystems represent a different approach to the problem of coordinating complementary resources [...] As a form of organisation, ecosystems are at an advantage in the “middle ground” where complementarities require consistent action and decision-making, but there are also benefits to autonomous search and independent experimentation.”⁸

Competitive interdependence between several players is not a novel phenomenon in economic relations. What sets however the interdependence in ecosystems apart from other

³ *Ibid.*, 111.

⁴ *Ibid.*, 132.

⁵ The concept originates from game theory (see, and has been popularized by A Brandenburger & BJ Nalebuff, *Co-opetition* (Doubleday, 1997) (describing the situations where businesses become more competitive trying to maximize their interests by cooperating and developing unique capabilities that add value and complement those of their competitors). See also, M. Bengtsson & S. Kock, *Coopetition—Quo vadis? Past accomplishments and future challenges*, (2014) 43(2) *Industrial Marketing Management* 180.

⁶ J.F. Moore, *Predators and Prey: A New Ecology of Competition*, (1993) 71(3) *Harvard Business Review* 75; F. Moore, *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems* (HarperCollins, 1996); M. Iansiti & R. Levien, *Strategy as Ecology*, (2004) 82(3) *Harvard Business Review* 68; J.F. Moore, *Business ecosystems and the view from the firm*, (2006) 51(1) *The Antitrust Bulletin* 31; MJ. Jacobides, C. Cennamo & A. Gawer, *Towards a Theory of Ecosystems*, (2018) 39(8) *Strategic Management Journal* 2255.

⁷ C. Y. Baldwin, “Ecosystems and Complementarity” *Harvard Business School Working Paper* (August 2020), 33.

⁸ *Ibid.*, 33.

types of organizational labour division (such as supply chains) is the fact that the value of the ecosystem (the complements and the core functions) is greater than the sum of the values of the different parts.⁹ Ecosystems exhibit the emergence of a “superadditive” and distinct value of the whole (the “ecosystem glue”), based on the contributions of each member of the ecosystem.¹⁰ This “joint value proposition by several players cannot be achieved by any one of the individual players in isolation.”¹¹

The modular structure of the ecosystem requires organizing principles and rules to enable technical interoperability between the various modules for complementarities to emerge. However, complementarities may not only result from the underlying technical system.¹² They crucially depend on ecosystem rules of cooperation and “membership.”¹³ It may precisely be “*because of these rules*, [that] it tends to be more attractive to purchase [product] A1 and B1 than to combine any of these with a version of the other which is not subject to these rules” (product A2 and B2).¹⁴ Hence, “an eco-system requires a mix of ownership and common rules which makes it more likely that consumers would purchase several items from different suppliers.”¹⁵ Summarising the state of understanding in this extensive literature, Baldwin et al. refer to ecosystems as “a network of autonomous economic actors interacting to create value, including a complementary surplus, which is distributed across actors”¹⁶. The emphasis is put here not only on complementarities in systems of use but also on the structure of interdependencies, technical or organizational, among others, that develops between the various ecosystem members.¹⁷

The business studies literature on ecosystems has initially focused on the boundaries of the concept and the types of economic interaction that could be covered by it. The definitional ambiguity resulted from the descriptive rather than normative approach followed by Moore who provided different definitions of what constitutes an ecosystem in his work:¹⁸ The concept of an ecosystem has gradually morphed from an analogy focusing on inter-dependent parts to the acknowledgment of a more conscious and deliberate set of complementarities (e.g. “a group of interacting firms that depend on each other’s activities... reliant on the technological leadership of one or two firms that provide a platform around which other system members, providing inputs and complementary goods, align their investments and strategies”).¹⁹ This

⁹ *Ibid.*,1.

¹⁰ See M. Jacobides & I. Lianos, Ecosystems and competition law in theory and practice, (2021) 30(5) *Industrial and Corporate Change*, 1199.

¹¹ B. Lingens, L. Miede & O. Gassman, The ecosystem blueprint: How firms shape the design of an ecosystem according to the surrounding conditions, *Long Range Planning* 54 (2021) 102043.

¹² See for instance the definition of ecosystems by C.Y. Baldwin, Organization design for business ecosystems. (2012) 1(1) *Journal of Organization Design*, 20-23. “Ecosystems...encompass numerous corporations, individuals, and communities that might be individually autonomous but [are] related through their connection with an underlying evolving technical system.”

¹³ M.G. Jacobides, C. Cennamo & A. Gawer, Externalities and complementarities in platforms and ecosystems: From structural solutions to endogenous failures, (2024) (53) *Research Policy* 104906, 1.

¹⁴ P. Regibeau, Current Challenges in Competition Policy (October 2022), part 3.5.

¹⁵ *Ibid.*, part 3.5.

¹⁶ C.Y. Baldwin, M.L.A.M. Bogers, R. Kapoor & J. West, Focusing the ecosystem lens on innovation studies, (2024) (53) *Research Policy* 104949, 1.

¹⁷ *Ibid.*, 3.

¹⁸ J.F. Moore, Predators and Prey: A New Ecology of Competition, (1993) 71(3) *Harvard Business Review* 75.

¹⁹ D. Teece, “Next-Generation Competition: New Concepts for Understanding How Innovation Shapes Competition and Policy in the Digital Economy,” (2012) 9 *Journal of Law & Policy*, 105-6.

was later complemented by an emphasis on the “alignment structure of the multilateral set of partners that need to interact for a focal value proposition to materialize.”²⁰ Narrowing down the definition further, Jacobides et al (2018) suggested that ecosystems are “groups of firms that must deal with either unique or supermodular complementarities that are nongeneric, requiring the creation of a specific structure of relationships and alignment to create value.”

This literature merely addressed the research question of how to harness (private) value for the participants in a business ecosystem, and in particular, the ecosystem orchestrator, addressing issues of allocation of the surplus value only to the extent these would limit the specific business ecosystem’s value potential. Broader social value issues, particularly the impact on external to business ecosystem actors, did not form part of the discussion, at least until recently. The engagement of competition authorities with the ecosystem concept has nevertheless led business studies literature to take a social value perspective in exploring the broader question of the optimal intervention of public governance institutions in business ecosystems.²¹ This recent literature attempts to provide a broader theory of “ecosystem externalities” or “ecosystem failures” that may eventually justify the intervention of competition authorities, to ensure the broader social (and not just ecosystemic) value generated by business ecosystems.

Taking an internal perspective, it emphasizes the importance of ecosystem governance rules that may code these broader public policy concerns. Without such rules, one can experience “value network” failures that may stem either from the lack of coordination between the independent firms interacting in the ecosystem, or “systemic innovation” failures arising out of difficulties in developing components or complements that support the innovation system in question. These failures may affect the capability of the ecosystem to attain its full surplus value potential and may either relate to functional or distribution disagreements between its members.²²

The integration of the concept of the ecosystem in the competition law toolkit has also led Industrial Organization (“IO”) and other experts to explore the contours of the concept and possible ecosystemic theories of harm that may be taken on by competition authorities to initiate *ex ante* or *ex post* competition law interventions.²³ This literature is however still embryonic and largely relies on the economic theory of competition, without, for the time being, any effort to develop a corresponding theory of co-opetition that would be adequate to assess the social costs and benefits of business conduct in a connexionist world²⁴. This

²⁰ R. Adner, “Ecosystem as Structure – An Actionable Construct for Strategy,” (2017) 43(1) *Journal of Management*, 42.

²¹ See for instance, M.G. Jacobides, C. Cenammo & A. Gawer, Externalities and complementarities in platforms and ecosystems: From structural solutions to endogenous failures, (2024) *Research Policy* 104906.

²² M.G. Jacobides, C. Cenammo & A. Gawer, Externalities and complementarities in platforms and ecosystems: From structural solutions to endogenous failures, (2024) *Research Policy* 104906, 1.

²³ See for instance, on *ex post* enforcement, M. Jacobides & I. Lianos, Ecosystems and competition law in theory and practice, (2021) 30(5) *Industrial and Corporate Change*, 1199; On *ex ante* enforcement, C. Cafarra & A. Galeoti, Ecosystem theories of harm in digital mergers: New insights from network economics, *VoxEU.org*, Parts 1 and 2, (2023).

²⁴ See, for instance, the criticisms of G. Dagnino & G. Padula, Co-opetition Strategy – A New Kind of interfirm Dynamics for value Creation (EURAM, 2002); G.B. Dagnino, G.B. Coopetition strategy: a new kind of interfirm dynamics for value creation. In Dagnino, G.B. and Rocco, E.(Eds.). *Coopetition Strategy: Theory Experiments and Cases* (Routledge, 2009) 25-43.

literature still tries to fit the ecosystem concept in the existing narrow conceptual framework of IO economics, without however attempting to engage with the study of ecosystems as a distinct institution of economic ordering than markets and other economic organizations, which has profound implications for the process of value generation and capture in modern capitalism, as well as the conceptualization and measurement of power positions (economic, but also any other dimension to which economic power may be converted) in ecosystems and more broadly. It does not also make any effort to link the study of ecosystems to the broader conception of the public good, integrating social and environmental sustainability concerns, polyarchy, and democracy, which forms the essence of the emerging new mainstream of polycentric competition law paradigm.²⁵

I claim in this short paper that to embrace the full potential of business ecosystems as an institution producing social value, one needs to abandon the narrow lenses of business studies and IO literature, and adopt a law and political economy perspective, to the extent that having been transplanted now into law, the concept needs to adjust to its host.²⁶ This also calls for the development of an overarching legal theory of ecosystems.²⁷

I will explore first the integration of the ecosystem concept in the competition law toolkit before moving to sketch the two crucial issues that a law and political economy approach may bring to the study of the concept: the focus on issues of (social) value and power. The last Section will briefly conclude.

II. ECOSYSTEMS IN COMPETITION LAW: AN HISTORICAL PERSPECTIVE

Although the emergence of digital ecosystems has been the trigger and irritant for the interest shown by public authorities in the digital platforms' phenomenon, the concept of ecosystem was not elaborated in most of the reports these commissioned to explore the possibilities of legal change. The concept was at best used descriptively and sometimes as an alternative to the concept of digital platform, without any proper effort being made to define its contours, nor any reflection about the challenges ecosystems may pose to the existing conceptions of power and theories of harm in competition law.²⁸

The Furman et al (2019) report in the UK included a few paragraphs on ecosystems, describing how “(t)he ecosystems around some products makes their persistence more likely,”

²⁵ I. Lianos, Polycentric Competition Law, (2018) 71(1) *Current Legal Problems* 161.

²⁶ A theory of (legal) translation is essential to understand the integration of economic transplants in law. See I. Lianos, Lost in Translation? Towards a Theory of Economic Transplants, (2009) 62(1) *Current Legal Problems*, Volume 346.

²⁷ See I. Lianos, K. Hendrik Eller & T. Kleinschmitt, The Limits of Private Governance of (Digital) Ecosystems – Towards a Legal Theory of Ecosystems (forth. 2024).

²⁸ The concept is only mentioned 15 times in the Furman report (J. Furman et al, Unlocking digital competition, Report of the Digital Competition Expert Panel (2019), https://assets.publishing.service.gov.uk/media/5c88150ee5274a230219c35f/unlocking_digital_competition_furman_review_web.pdf). it is mentioned 105 times in the Report for the European Commission (Schweitzer et al, Competition policy for the digital era - Publications Office of the EU (europa.eu) (2019), 30 times at the Stigler committee's report (Stigler Committee on Digital Platforms Final Report (2019) [digital-platforms---committee-report---stigler-center.pdf](https://www.stiglercenter.org/wp-content/uploads/2019/06/digital-platforms---committee-report---stigler-center.pdf) (chicagobooth.edu)), 98 times at the House of Representatives Majority Report, (Investigation of Competition in Digital Markets- Majority Staff Report and Recommendations (2020)

and expressing some concerns that “large digital companies have also used acquisitions to develop strong ecosystems across multiple layers of value chains in order to cement their position in their main market, though this is not to say that every acquisition should be viewed from this perspective.”²⁹

The EU Report (Schweitzer et al) dedicated more attention to ecosystems and included a specific section analyzing competition among ecosystems (inter-ecosystemic competition).³⁰ The report defines ecosystems as “an ensemble of services, some complementary, connected to another through private APIs which are APIs accessible only to services from the same ecosystem.”³¹ It acknowledges that “the emergence of ecosystems and the complementarity of services with one another and with devices is an important, but not yet very well researched, element of competition,”³² although it also explains that “firms compete to draw consumers into more or less comprehensive ecosystems,” which “allow them to steer demand towards products and services that belong to the ecosystem.”³³ This phenomenon is more intense in multi-function devices such as computers and smartphones, as “control over the devices allows a platform to become a gatekeeper in terms of access to consumer data and capacity to deliver content and services.”³⁴ The Report even suggests that “where the firms’ lock-in strategies are successful, and consumers are drawn into ecosystems which they find difficult to leave, ecosystem-specific aftermarkets may need to be defined.”³⁵ However, the concept of ecosystem doesn’t appear even once in the Section of the Report regarding market definition and measurement of market power.³⁶

The Stigler committee report does not engage with the concept, but only includes a statement that “increased scale and scope of control has provided modern digital platform owners with increased power over their ecosystems.”³⁷ Similarly, the U.S. House of Representatives majority Report only refers to the fact that Apple’s market power is durable “due to high switching costs, ecosystem lock-in, and brand loyalty.”³⁸

The most elaborate discussion on ecosystems is included in the BRICS Digital Era Report, the Report dedicating various sections on inter- and intra-ecosystem competition, vertical competition, vertical nonstructural power, and metrics for the assessment of vertical power and power in ecosystems.³⁹ Although the discussions over the adoption of Article 19A in Germany focused on digital platforms, and the provision does not include any reference to

templatelab.com/competition-in-digital-markets/), but 421 times at the BRICS Digital Era Competition Report which also dedicates specific Sections on ecosystem competition (Lianos, Ioannis and Ivanov, Alexey, Digital Era Competition BRICS Report (August 30, 2019). Available at SSRN: <https://ssrn.com/abstract=3901413> or bricscompetition.org/uploads/publications/brics-book-full-00d8c66ce2.pdf).

²⁹ Furman et al . Report, 40 seq.

³⁰ Schweitzer et al. Report, 33 seq.

³¹ *Ibid.*, 34.

³² *Ibid.*

³³ *Ibid.*, 47.

³⁴ *Ibid.*, 48.

³⁵ *Ibid.*

³⁶ *Ibid.*

³⁷ Stigler Report, 70.

³⁸ U.S. House of Representatives Majority Report, 334.

³⁹ BRICS Competition Report, 322 seq. & 351 seq.

ecosystems, it is clear that the provision aims to deal with competition issues arising out of the existence of business ecosystems.⁴⁰

A further step towards the recognition of ecosystems as an operational concept in competition law was made with the proposal for Article 2A of the new Greek Competition Law Bill submitted in August 2021, proposed by a Law Commission which I had the honor to chair.⁴¹ The introduction of Article 2A in the revision of Greek Competition Law 3959/2011 aimed at covering lock-in situations that may produce negative effects on competition and innovation, and which could not fall under the provision on abuse of dominance. But the essence of the provision and the added value it brought to competition law enforcement related to its focus on ecosystems. In the background, stands the realisation that competition law should take into account the strategies used by economic actors to create and capture value by competing for strategic or architectural advantage⁴² in the context of an ecosystem, when these strategies may negatively and significantly impact competition, focusing at both inter- and intra-ecosystem competition. It was recognized in the accompanying report for this amendment that treating certain economic activities as parts of an ecosystem and investigating them as such, helps to develop a more holistic appraisal of competitive sources and pressures. Due to the nature of the products and services offered by digital ecosystems, the boundaries between stages of the value chain dissolve, making some companies more powerful⁴³ and potentially opening the door to new complementary markets.⁴⁴ To get an accurate picture of the origins of competition and points of control, we must take a holistic view of the entire system.

Ecosystems, as defined in this law, included various companies and nexuses of dependency, and care was taken to distinguish this situation from conventional vertical relationships between actors and supply chains, to the extent that in ecosystems complementarities are linked to the existence of a private governance regime and specific rules coordinating the contributions of each member of the ecosystem which exhibit a superadditive

⁴⁰ See P. Hornung, The Ecosystem Concept, the DMA, and Section 19a GWB, (2023) *Journal of Antitrust Enforcement* jnad049, <https://doi.org/10.1093/jaenfo/jnad049> (noting that although text of Art. 19A does not mention the concept and that in the accompanying text of the government's proposal, it only comes up once, in the accompanying report of the Bundestag, it is referred to twelve times and more crucially in the designation decisions of the Bundeskartellamt the term "ecosystem" is mentioned dozens or even hundreds of times).

⁴¹ This section draws on Ioannis Lianos, Reorienting competition law, (2022) 10(1) *Journal of Antitrust Enforcement*, 1–31, <https://doi.org/10.1093/jaenfo/jnac003>.

⁴² M.G. Jacobides, T. Knudsen & M. Augier "Benefiting from innovation: Value creation, value appropriation and the role of industry architectures." (2006) *Research Policy* 35(8): 1200–1221; G. Pisano & D. Teece, "How to Capture Value from Innovation: Shaping Intellectual Property and Industry Architecture," (2007), *California Management Review*, 50(1).

⁴³ C. Baldwin & J. Woodard, The Architecture of Platforms: A Unified View, *in* *Platforms, Markets and Innovation* 24–26 (A. Gawer ed., 2009), T. Eisenmann et al., "Platform Envelopment," (2011) 32 *Strategic Management Journal* 1270.

⁴⁴ T. Bresnahan & S. Greenstein, "Technological Competition and the Structure of the Computer Industry," (1999) 47 *Journal of Industrial Economics* 1, 37–38. See also T. Bresnahan, "New Modes of Competition, *in* *Competition, Innovation and the Microsoft Monopoly: Antitrust in the Digital Marketplace* 155 (J. Eisenach & T. Lenard, eds 1999), T. Eisenmann et al., "Platform Envelopment," (2011) 32 *Strategic Management Journal* 1270. For a synopsis of the relevant theories see K. Stylianou, "Exclusion in Digital Markets," (2018) 24 *Michigan Technology Law Review* 181, 202–219; I. Lianos, *Blockchain Competition – Gaining Competitive Advantage in the Digital Economy: Competition Law Implications*. In P. Hacker, I. Lianos, G. Dimitropoulos & S. Eich (Eds.), *Regulating Blockchain: Techno-Social and Legal Challenges*, (Oxford: Oxford University Press, 2019); BRICS Report, (2019) "Digital Era Competition" 181, 300, 550, available at <http://bricscompetition.org/upload/iblock/6a1/brics%20book%20full.pdf>.

and distinct value of the whole (the “ecosystem glue”) as it is because of these rules that it tends to be more attractive to purchase products from the same ecosystem source rather than to combine any of these with one from a different ecosystem.⁴⁵ 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 (technological, financial, and human) needed to participate
- ii. The fact that the user or group of users are provided with a coherent and often financially integrated offering, even though multiple actors are involved (with the distribution of revenues often not being made explicit); relatedly, there are positive or negative feedback loops between different categories of users, and
- iii. Often the sunk costs that complementors must invest for a “seat at the table,” which may result in them being locked in. This may raise an issue since the scope and extent of the ecosystem are such that potential ecosystem participants would be materially worse off if they chose *not* to participate in the ecosystem. This may be the case if the ecosystem is based on a key technological platform, which constitutes a central point for the harvesting of data, the management of incentives for the coordination of the ecosystem, and especially if it is characterized by direct or indirect network effects giving it influence and power over participants across different markets related by data network and learning effects.

The text of the proposed provision provided as following:

Article 2A

Abuse of position of power in an ecosystem of structural importance to competition

1. Any abuse by an undertaking of its position of power in an ecosystem of structural importance to competition in the Greek territory is prohibited.

If the requirements for the application of the present article and of articles 2 of the present Law and 102 TFEU are met, only the latter articles shall apply, excluding application of the present.

2. For the purposes of the application of para. 1, the Hellenic Competition Commission shall take into account the business model of the ecosystem and the rules governing the relations of the parties involved. The Hellenic Competition Commission shall also consider any adequately justified objective reasons put forward and which concern the practices at issue.

3. a) An “ecosystem” is defined as: (a) a nexus of interconnected and, to a great extent, interdependent economic activities of different undertakings aiming at the provision of products or services which impact on the same group of users; or (b) a platform connecting economic activities of different undertakings with the purpose of providing one or more products or services, affecting either the same users or different groups of business users or end users.

b) A “platform” is defined as an entity operating either as an intermediary for transactions between interdependent groups of end users and business users or

⁴⁵ P. Regibeau, Current Challenges in Competition Policy (October 2022), part 3.5.

between interdependent groups of business users, or as an infrastructure for the development and provision of different, yet interconnected, products and services.

4. An ecosystem shall be presumed to be of structural importance to competition where non participation in it substantially affects the effective exercise of business activities by third parties. When determining an ecosystem's structural importance to competition, account shall be taken particularly of the following elements: (a) the economic power or the significant share of the ecosystem concerned in the total turnover, or in the revenue of one or more sectors of the Greek economy, (b) its access to substantial resources, in particular to a significant number of business users depending on the ecosystem in order to connect with end users or to sensitive data and information relevant to competition, (c) the significance of its activities with regard to the access of third parties to procurement and sales markets in the Greek territory.

Notwithstanding the fulfilment of the requirements stipulated in the previous sentence, an ecosystem shall be presumed to lack structural importance to competition where, at least four (4) other independent ecosystems operate in parallel to it and such ecosystems constitute a viable alternative for users.

5. A "position of power" in an ecosystem is defined as the position of economic strength enjoyed by an undertaking, which affords it the power to behave to an appreciable extent independently of its competitors, its customers and, in general, the users of the ecosystem. When determining the possession by an undertaking of a position of power in an ecosystem, account shall be taken, *inter alia*, of the following elements: (a) the control by such undertaking of necessary resources and infrastructure for the economic activity of other undertakings, (b) the undertaking's capacity to lay down rules regulating the operation of the ecosystem and the access of third parties to it, (c) the undertaking's increased bargaining power *via-a-vis* business users and end users of the ecosystem, (d) 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 respective alternative solution.

6. The Hellenic Competition Commission may initiate *ex officio* investigation in order to establish whether there has been an infringement of para. 1. Where an infringement is found, the Hellenic Competition Commission issues a decision, which is notified to the undertaking concerned, by virtue of which the undertaking is obliged to cease the infringement and refrain from it in the future. By the same decision, the Hellenic Competition Commission may invite the undertaking, within 60 days from the notification of the decision, to propose remedies which it intends to impose for the undertaking to comply effectively with the decision of the Hellenic Competition Commission.

7. The Hellenic Competition Commission issues a decision within one hundred twenty (120) days following notification of the preceding decision of the Hellenic Competition Commission finding an infringement, by virtue of which, remedies proposed by the undertaking pursuant to para. 6 shall be made binding to it.

In case the proposed remedies are not considered appropriate, the Hellenic Competition Commission, following a hearing of the undertaking, may impose behavioral remedies as appropriate and necessary for the infringement to be

ended, depending on the nature and the gravity of the infringement and on the business model of the ecosystem concerned.

8. The General Directorate for Competition of the Hellenic Competition Commission may initiate proceedings to monitor compliance with a decision adopted pursuant to para. 7 and the Hellenic Competition Commission may issue a decision with respect to the compliance of the undertaking.

By virtue of a decision of the Hellenic Competition Commission and where non-compliance of the undertaking has been established, the undertaking concerned is obliged to cease non-compliance and refrain from it in the future, and the Hellenic Competition Commission may also impose a fine to the undertaking pursuant to para. 2 of Article 25B.

Article 2A was ill-fated: in the presence of ferocious opposition by vested business interests (in particular from the telecom oligopoly in Greece, mainly for fear that the tool could expand the jurisdiction of the Hellenic Competition Commission in the telecom sector, from which it is now excluded), and despite the support received by the major consumer associations in Greece, but also BEUC,⁴⁶ the major associations of small and medium undertakings and the association of businesses in the tourist industry, as well as some of the main opposition parties, the government withdrew the proposed reform, although it left open the possibility for revisiting the issue, once the EU Digital Markets Act were to be implemented.

This provision, the publication of a special issue on ecosystems in competition law in the *Industrial and Corporate Change* journal (led by Michael Jacobides and myself),⁴⁷ and the organization of workshops on the topic at the OECD⁴⁸ and by the Hellenic Competition Commission (“HCC”),⁴⁹ gave more prominence to this debate. The concept was thoroughly explored in the Support document commissioned by the European Commission for the preparation of the new Market Definition Notice, which dedicated a Section exploring the relevant literature on business ecosystems and Article 2A of the proposed Greek bill.⁵⁰ Effort was made by some authors to transplant the concept of the ecosystem from the business studies literature to a more operational legal concept.⁵¹

The Digital Markets Act refers to ecosystems only three times, and in its recitals (not the core text), however the concept of ecosystem was very much present in the discussions and negotiations, in particular regarding the qualitative criteria that could be considered for the designation of a gatekeeper: although there have been suggestions by some delegations as to

⁴⁶ <https://www.beuc.eu/publications/greek-draft-law-%E2%80%9Cmodernization-competition-law-digital-age%E2%80%9D/html>.

⁴⁷ M.G Jacobides & I. Lianos, Regulating platforms and ecosystems: an introduction, 2021) 30(5) *Industrial and Corporate Change* 1131–1142.

⁴⁸ See <https://www.oecd.org/daf/competition/competition-economics-of-digital-ecosystems.htm#:~:text=Competition%20in%20the%20digital%20economy,services%20around%20their%20core%20service>.

⁴⁹ See <https://www.epant.gr/en/enimerosi/publications/media/item/1596-ecosystems-competition-law.html>.

⁵⁰ European Commission, Support study accompanying the Commission Notice on the evaluation of the definition of relevant market for the purposes of Community competition law, Final Report (2021), https://competition-policy.ec.europa.eu/document/download/92e7adf6-6a0f-4bb2-87bf-e81ba491e8c4_en?filename=kd0221712enn_market_definition_notice_2021_1.pdf.

⁵¹ See in particular, M. Jacobides & I. Lianos, Ecosystems and competition law in theory and practice, (2021) 30(5) *Industrial and Corporate Change*, 1199.

the need to include among these criteria (which are not cumulative) the control of a business ecosystem, it was preferred to add as one of the factors in the analysis “a conglomerate corporate structure or vertical integration of that undertaking, for instance enabling that undertaking to cross-subsidize, to combine data from different sources or to leverage its position,”⁵² which has a narrower scope, to the extent that it relies on a leveraging theory of harm and thus implicitly integrates a capability and incentives framework. The ecosystem concept has a more structuralist connotation and allows for intervention beyond the capability and incentives framework (which is more behaviouralist-driven). This missed occasion probably needs to be rectified in the next revision of the DMA, or at the designation decisions that refer to the qualitative criteria of Art. 3(8) of the DMA.⁵³

The official entry of the concept of ecosystem in competition law jargon was however completed with the recently adopted European Commission market definition notice, which dedicates a Section on “(digital) ecosystems,”⁵⁴ as a special case that is in a distinct Section in the analysis by the Commission from multi-sided platforms and categorized together with after-markets and bundles.⁵⁵ The Commission proceeds to a definition of “(Digital) ecosystems” “as consisting of a primary core product and several secondary (digital) products whose consumption is connected to the core product, for instance, by technological links or interoperability” and continues that “(w)hen considering (digital) ecosystems, the Commission may thus apply similar principles to those applied to after-markets to define the relevant product market(s),” actually taking a narrow perspective on the use of this concept that corresponds to one of the possible strategies ahead explored in the Jacobides/Lianos matrix for ecosystems analysis, thus not integrating yet the complexity of other complex systems than aftermarkets.⁵⁶ According to the Commission, “(a)lthough not all (digital) ecosystems fit an after-market or bundle market approach, the Commission takes into account, where relevant,

⁵² Art. 3(8)(f) DMA.

⁵³ For the time being the Commission has not used these qualitative criteria and the concept of ecosystem appears scarcely in the designation decisions [see, however, the one on Meta which notes that “recital (3) of the preamble to Regulation (EU) 2022/1925 identifies as a common feature of platform ecosystems the ability to connect many business users with many end users through their services and to leverage the resulting advantage“ (para. 305, available at https://ec.europa.eu/competition/digital_markets_act/cases/202346/DMA_100044_138.pdf] although it plays a more prominent role in the designation decision for Byte Dance, one of the arguments of Byte Dance for not being designated is that it lacks of an ecosystem and of significant network effects: see https://ec.europa.eu/competition/digital_markets_act/cases/202344/DMA_100040_141.pdf. The Commission responds to this argument noting that “nothing in Regulation (EU) 2022/1925 suggests that having an ecosystem is an absolute pre-requisite to be an important gateway for business users to reach end users. The existence of vertical integration and of an ecosystem of different services are part of a non-exhaustive list of several elements referred to in recitals (2) and (3) of the preamble to Regulation (EU) 2022/1925 which contribute to explaining the reasons why the legislators laid down the conditions under which certain CPSs constitute an important gateway for business users to reach end users. Recital (3) of that Regulation, in particular, states that “[s]ome of those undertakings exercise control over whole platform ecosystems [...]” which makes clear that not all gatekeepers have such control over an entire ecosystem of services in the Union. Moreover, the very notion of an “ecosystem” comprises various business models and therefore each ecosystem needs to be assessed on a case-by-case basis, taking account of the various benefits or the lack thereof derived from such way of operating, in particular those that may impact contestability“ (para. 130). Furthermore, it acknowledges that ByteDance does in fact operate its own ecosystem consisting of highly popular video-editing services, enterprise software, advertising, news, and healthcare applications” (para. 132).

⁵⁴ Commission Notice on the definition of the relevant market for the purposes of Union competition law, C/2024/1645, Section 4.5.

⁵⁵ Multi-sided platforms are covered by Section 4.4.

⁵⁶ M.G Jacobides & I. Lianos, *Regulating platforms and ecosystems: an introduction*, 2021) 30(5) *Industrial and Corporate Change* 1131, 1208 (Table 2).

factors such as network effects, switching costs (including factors capable of leading to customer lock-in) and (single- or multi-) homing decisions for the purpose of defining the relevant product market(s).”⁵⁷ These insights are of course welcome, but certainly not illuminating, hence it will be important to watch the way the Commission will implement these broad directions in its decisional practice.

In contrast, the recently published U.S. DOJ and FTC Merger Guidelines, do not engage with the concept of ecosystem, and simply refer to it only twice when describing the issues raised by the elimination by a merger of a nascent competitive threat.⁵⁸ They also limit the use of the concept in situations in which the incumbent retains and reinforces its dominant position by eliminating a nascent competitive threat, which is one of the possible scenarios of ecosystemic harm to competition.

In a remarkable development, the General Court also has employed the concept of ecosystem in the *Google Android* case.⁵⁹ Without referring to ecosystem theories of harm, the Court explored the intensity of inter-ecosystem competition between Apple and Google and concluded that this was not of that extent to include the Apple ecosystem in the analysis of the competitive constraints Google faced in the different relevant markets considered for establishing a bundling/tying practice.⁶⁰ The General Court examined the concept of ecosystem, acknowledging that a digital “ecosystem”

brings together several categories of supplier, customer and consumer and causes them to interact within a platform, the products or services which form part of the relevant markets that make up that ecosystem may overlap or be connected to each other on the basis of their horizontal or vertical complementarity. Taken together, the relevant markets may also have a global dimension in the light of the system that brings its components together and of any competitive constraints within that system or from other systems.⁶¹

Having defined the concept of ecosystem as a distinct operational concept from that of relevant market, to the extent that it may concern many relevant markets, the General Court adds the following:

Identifying the conditions of competition relevant to the assessment of the position of economic strength enjoyed by the undertaking concerned may therefore require multi-level or multi-directional examination in order to determine the fact and

⁵⁷ Commission Notice on the definition of the relevant market (2004), para. 104.

⁵⁸ US DOJ and FTC, Merger Guidelines (December 18, 2023), p. 20 (noting that “the nascent threat supports what may be referred to as “ecosystem” competition” and explaining that “ecosystem competition refers to a situation where an incumbent firm that offers a wide array of products and services may be partially constrained by other combinations of products and services from one or more providers, even if the business model of those competing services is different”).

⁵⁹ Case T-604/18, *Google and Alphabet v. Commission* (Google Android), ECLI:EU:T:2022:541.

⁶⁰ *Ibid.*, para. 272.

⁶¹ *Ibid.*, para. 116.

extent of the various competitive constraints that may be exerted on that undertaking.⁶²

This may open the door to a more holistic approach about ecosystem theories of harm, and also ecosystem power,⁶³ but it may also provide undertakings the possibility to put forward ecosystem-related efficiencies or justifications. This did not escape Google which effectively “dressed” its justification of the anti-fragmentation agreement as an effort to protect the security and integrity of its ecosystem.⁶⁴ The Commission, confirmed by the General Court, did not find this objective justification convincing.⁶⁵

Some recent merger Commission decisions also engage with ecosystem theories of harm, although as they have not yet been published, it is difficult to understand the way this plays out in practice.⁶⁶ Ecosystem theories of harm seem to have had an important impact in the prohibition by the Commission of the *Booking/eTraveli* merger in September 2023,⁶⁷ in particular finding that “the transaction would have allowed Booking to expand its travel services ecosystem, which revolves around its hotel OTA business,” to the extent that a flight OTA product “is a crucial growth avenue in this ecosystem as it would generate significant additional traffic to Booking's platform.” Indeed, flights have the highest chance to lead to the cross-selling of accommodation and this would have allowed Booking to benefit from existing customer inertia because a significant share of these additional consumers would have stayed on Booking's platforms. The Commission found that, overall, the transaction would have made it more difficult for competitors to contest Booking's position in the hotel OTA market, strengthening its dominant position in the market.⁶⁸

It is crucial to note here that from the Commission's press release it looks that it has not required as it usually does in other leveraging theory cases evidence of some form of bundling conduct or strategy that the merged entity may adopt in the future, which needs to be assessed under the traditional capability and incentives framework: the simple ecosystem glue generates the probable anticompetitive effects that motivate the Commission's prohibition in this case, of course along with other findings, such as the Booking's dominant position, the presence of barriers to entry and expansion, making it harder for competing OTA to develop a customer base capable of supporting a hotel OTA business, and the existence of bargaining power that may be exercised against hotels and business clients. This is quite important as it may be argued, following the *Tetra/Laval* and *Schneider/ Legrand* precedents, that the possible application of Article 102 TFEU, or even the DMA provisions, in case the undertaking in

⁶² *Ibid.*, para. 117.

⁶³ Not the reference of the General Court in para. 880 “suffice it to note that Google does not seriously call into question the findings set out in the contested decision relating to the superior market power of the ‘Android ecosystem.’”

⁶⁴ *Ibid.*, para. 857.

⁶⁵ *Ibid.*, para. 878, 880 (noting “the extremely rapid growth of the ‘Android ecosystem’ from the early 2010s onwards makes Google's claims regarding the hypothetical risk that the threat which it describes to the very survival of that ‘ecosystem’ could have continued throughout the infringement period implausible. It follows that that justification must be rejected”) & 884 (where it remarks, concerning Google's allegation of externalities that may affect the reputation of its ecosystem that “the risk of propagation to the detriment of the Android ecosystem has not been sufficiently established in the present case”).

⁶⁶ For a discussion, see the event organized by the Centre for Law, Economics & Society at UCL Faculty of Laws, <https://www.ucl.ac.uk/laws/events/2023/oct/rise-ecosystem-theories> .

⁶⁷ European Commission, Case M.10615 (2023).

⁶⁸ See https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4573 .

question has been designated as a gatekeeper for the specific core platform service, that the issues arising could be dealt *ex post* (with Art. 102 TFEU) or even *ex ante* (through the DMA), with the result that it cannot be assumed that the undertaking in question will have the incentives to adopt bundling or other leveraging practice.⁶⁹ This argument possibly fails if the problem is the abnormal competitive advantage which is provided by the ecosystem glue rather than some form of conduct – hence the problem is not so much the adoption of a future conduct that if the capability and incentives framework shows that it leads to anticompetitive foreclosure, as the expansion of the ecosystem itself and the addition of an activity which because of the ecosystem glue may lead to the exclusion of effective competition. But of course, nothing can be concluded before the decision is finally published.

III. A LAW AND POLITICAL ECONOMY PERSPECTIVE

Although the concept of ecosystem has now been recognized in competition law, it remains still an open question how this will be operationalized and how it will impact the traditional understandings of power/dominance, theories of harm, and objective justifications, to cite a few elements of a competition law case. More recent business literature acknowledges the lack of a clear operational definition of the constitutive elements of ecosystems, and more significantly of a theory of ecosystem externalities that may be of value to policy-makers and drive public governance regimes.⁷⁰ Economic literature laments the reliance on the traditional economic leveraging theories of harm but has not yet put forward a clear alternative.⁷¹ There are inherent limitations in the business studies literature to provide a holistic theoretical framework for ecosystem externalities, to the extent that it focuses on how ecosystems may generate (economic) value for some ecosystem members (the orchestrator and eventually the complementors), without engaging with the broader dimensions of ecosystem social value and a larger group of stakeholders, and the institutional choice between private or public governance to deal with specific ecosystem “failures” and “externalities”⁷².

The economic literature seems stuck to its usual emphasis on economies of scale and scope, thus the benefits of the big size, and is still unable to fully assess quality effects and

⁶⁹ See Case T-5/02, *Tetra Laval*, ECLI:EU:T:2002:264; Case T-310/01, ECLI:EU:T:2002:254. In these cases the GC found that, although leverage was theoretically possible, the Commission accepted that it would not result directly from the merger, but only from the likely subsequent conduct of the merged firm. The GC accepted that the Commission enjoyed a certain discretion when assessing economic issues. Nevertheless, a conglomerate merger did not directly increase the firms’ market power. It was for the Commission to produce convincing evidence that this was likely. It should, therefore, have considered whether such conduct would be illegal under Article 102 TFEU. This was confirmed by the Court of Justice (see, Case C- 12/ 03 P, *Commission v. Tetra Laval* [2005] ECR I- 987, para 75, which noted that it could not be assumed that the parties would infringe Article 102 TFEU. The Commission should therefore have examined comprehensively whether the merged entity would be likely to abuse its dominant position, but the GC had gone too far in requiring the Commission to examine both the extent to which the incentive to adopt anti-competitive conduct would be reduced or eliminated on the ground that it was unlawful and the likelihood of detection.

⁷⁰ See M.G. Jacobides & C. Cenammo, A. Gawer, Externalities and complementarities in platforms and ecosystems: From structural solutions to endogenous failures, (2024) *Research Policy* 104906, 1 (noting that “(s)ome fundamental questions remain: How do platforms and ecosystems differ as constructs? How do they emerge, and what problems do they solve? And what *inherent faults* might they entail?”).

⁷¹ C. Cafarra & A Galeoti, Ecosystem theories of harm in digital mergers: New insights from network economics, *VoxEU.org*, Parts 1 and 2, (2023).

⁷² For a first effort, see I. Lianos, K. Hendrik Eller & T. Kleinschmitt, **THE LIMITS OF THE PRIVATE GOVERNANCE OF (DIGITAL) ECOSYSTEMS - TOWARDS A LEGAL THEORY OF DIGITAL ECOSYSTEMS**, (CLES, FORTH. 2024).

impacts on the process of competition and other parameters of competition (innovation, variety, sustainability, resilience), let alone other broader societal impacts that may be generated by the restriction of competition in or by ecosystems, which seems also to form part of the social contract in some jurisdictions.⁷³ There is a need to develop a legal theory of the ecosystem, that borrows from the business studies and economic literature and remains cognitively open to other sources of wisdom, but which is normatively enclosed by the broader social (public) values of the specific legal system. It is thus important to adopt a law and political economy perspective to competition law⁷⁴ that will emphasize a multi-dimensional concept of ecosystem value, and of ecosystem power, integrating the social values protected by the specific polity, as this transpires in the constitutional texts, legislation and decisional practice of the competent public authorities. I will briefly sketch these two areas which, in my view, may benefit from a more systematic analysis.⁷⁵

A. Ecosystem Value

The “ecosystemic mindset” is very much based on the social relationships that develop between the various actors cooperating within and the contribution to the value generation process of various stakeholders. There is however some disagreement within the business studies literature from which the concept first emerged as to the group of stakeholders that needs to be considered. Even Moore in his work takes conflicting perspectives as to the relevant stakeholders: while in his 1996 work he mentions that “a business ecosystem is made up of customers, market intermediaries [...] suppliers, and of course, oneself,” he continues “(t)hese might be thought of as the primary species of the ecosystem [...] (b)ut a business ecosystem also includes the owners and other stakeholders of these primary species, as well as powerful species who may be relevant in a given situation, including government agencies and regulators, and associations, and standards bodies representing customers or suppliers.”⁷⁶ In his more recent work, however, he seems to focus on the ecosystem leaders and their complementors.⁷⁷

The larger the group of stakeholders one includes in the ecosystem, the more multi-dimensional the definition of the ecosystem’s value will be.⁷⁸ In this view, capabilities will not only result from the meritorious investments, strategies, and business models of a specific keystone firm⁷⁹ but emanate from a social process of co-production of value to which contribute several socio-economic agents participating in the ecosystem in question (business

⁷³ I. Lianos, Polycentric Competition Law, (2018) 71(1) *Current Legal Problems*, 161–213; I. Lianos, Competition Law as a Form of Social Regulation, (2020) 65(1) *The Antitrust Bulletin*, 3-86

⁷⁴ On a law and political economy approach to competition law, see I. Lianos, Value extraction and institutions in digital capitalism: Towards a law and political economy synthesis for competition law, (2022) 1(4) *European Law Open* 852-890.

⁷⁵ A more elaborate analysis of the legal theory of ecosystems is offered in I. Lianos, K. Hendrik Eller & T. Kleinschmitt, **THE LIMITS OF THE PRIVATE GOVERNANCE OF (DIGITAL) ECOSYSTEMS - TOWARDS A LEGAL THEORY OF DIGITAL ECOSYSTEMS**, (CLES, FORTH. 2024).

⁷⁶ F. Moore, *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems* (HarperCollins, 1996), 26.

⁷⁷ J.F. Moore, Business ecosystems and the view from the firm, (2006) 51(1) *The Antitrust Bulletin* 31, 34.

⁷⁸ I. Lianos, Value extraction and institutions in digital capitalism: Towards a law and political economy synthesis for competition law. *European Law Open*. 2022;1(4):852-890. doi:10.1017/elo.2023.

⁷⁹ M. Iansiti & R. Levien, *The Keystone Advantage - What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability* (Harvard Business School press, 2004).

partners/complementors (e.g. suppliers of inputs), users, the local community, the State etc.),⁸⁰ the value ecosystem *lato sensu*. Capabilities (either dynamic or ordinary) may thus not only be associated with lead/keystone firms, whose innovation incentives should not be stifled but are also developed at the level of the ecosystem *lato sensu*, that is, the broader community co-producing social value.

The social costs generated by ecosystems also do not only relate to “value network failures” in the narrow sense that the “natural order rhetoric” has recognised, but because of this broader perspective on who are the stakeholders in an ecosystem, may extend beyond the usual focus on orchestrators and complementors, and concern users (end-consumers), but also local communities and citizens, to the extent that digital ecosystems often include thousands of firms and have a significant impact on economic activity in various industries. Functional and distributional failures may affect several stakeholders that are not usually adequately represented in the institutions of private governance of ecosystems, imposing externalities on them, to the extent that their contribution to or costs incurred are not factored in a situation in which ecosystems (*stricto sensu*) will be only accountable to the shareholders of the orchestrator and complementor firms. Such externalities may result from a lack of competition, due to positions of architectural power or innovation bottlenecks, for example, or be broader (social and psychological externalities).⁸¹

From this perspective, checking who exercises power in the ecosystem and how this power may impact, not just consumers, but also all those that contribute to the ecosystemic socio-economic value, and on different dimensions, such as innovation, requires the development of new approaches focusing on power positions at the level of the ecosystem or that of the value chain.⁸² This brings to the fore the importance of the social structure of the economic activity organised in the context of business ecosystems and calls for a different conception of power than the economic concept of market power, at the level of the ecosystem.

*B. Ecosystem Power*⁸³

Although there has been some work in IO economics transposing traditional concepts of market power in networks and, for instance, advancing the importance of “node criticality,”⁸⁴ this is still an area that requires substantial investment in research and also a broader mindset that

⁸⁰ Note the importance of State investment in the emergence of modern digital ecosystems: see M. Mazzucato, *Mission Economy: a Moonshot Guide to Changing Capitalism* (Harper Business, 2021).

⁸¹ M.G. Jacobides, C. Cennamo & A. Gawer, Externalities and complementarities in platforms and ecosystems: From structural solutions to endogenous failures, (2024) *Research Policy* 104906, 7.

⁸² I. Lianos & B. Carballa-Smichowski, A Coat of Many Colours – New Concepts and Metrics of Economic Power in Competition Law and Economics, (2022) 18(4) *Journal of Competition Law & Economics* 795-831.

⁸³ This section partly draws on I. Lianos & B. Carballa-Smichowski, A Coat of Many Colours – New Concepts and Metrics of Economic Power in Competition Law and Economics, (2022) 18(4) *Journal of Competition Law & Economics* 795-831

⁸⁴ See for instance, S. Choi, A. Galeotti & S. Goyal, Trading in Networks: Theory and Experiments, (2017) 15(4) *Journal of the European Economic Association*, 784–817.

engages with the way the concept of power is assessed in other disciplines dealing with networks, such as advanced social network analysis or computational sociology.⁸⁵

The topology of networks may indeed become a particularly rich resource to understand the quite complex interactions between the participants in ecosystems in which the interrelations between the various participants often lead to non-linear increases in utility and value. Complex systems, such as the multi-actors ecosystems of the digital economy, are not populated by homogeneous predictable agents but by a collection of heterogeneous agents (individuals, organizations etc.), the state of whom influences and is influenced by the state of others (for instance, situations of social contagion), and the interactions of whom give rise to global systemic properties that equate to more than the sum of individual behavior. As the interactions within the multi-actors ecosystem are not independent, various feedback loops, some of which may be situated outside the sub-system of the relevant market, can enter into the system and affect the individual decisions of the specific relevant market agents.

As the focus moves from specific outcomes (prices, output) to social relations, it becomes important to acknowledge that complex social systems such as multi-actor ecosystems are populated by a collection of heterogeneous agents, all influencing each other. Their interactions give rise to global systemic properties that equate to more than the sum of the individual behavior of each actor. Hence, in this more complex economy, power may encompass various dimensions beyond that of a simple reduction of output and/or an increase in prices, or even narrow definitions of a quality parameter of competition.⁸⁶

Furthermore, a social actor's power does not often relate to his characteristics and exceptional attributes but may also be a function of the network structure, to the extent that this actor holds a pivotal position in the underlying social structure of the exchange. Given "the tendency of complex systems to create asymmetric network structures, in which some nodes are 'hubs,' and are far more connected than others," it is essential to examine the topography of such complex systems⁸⁷ and to develop concepts of "positional power."⁸⁸ Centralized networks provide actors with the necessary levers to extend their influence and thus reach sooner the tipping point towards sustainable dominance, eventually using the networks for their purposes rather than those that led to the formation of the network in the first place. Centrality measures, such as degree centrality (where the node strength gives a measure of local influence), betweenness centrality (the amount that a node lies on the shortest path between other nodes), and closeness centrality (inverse sum of shortest distances), which measure centrality at the level of a specific node, are indeed the most commonly used indicators to assess the importance of an actor in a network.⁸⁹ This is still a work in progress and it becomes essential to develop more systematic links between business studies literature, IO economics,

⁸⁵ See I. Lianos & B. Carballa-Smichowski, A Coat of Many Colours – New Concepts and Metrics of Economic Power in Competition Law and Economics, (2022) 18(4) *Journal of Competition Law & Economics* 795-831.

⁸⁶ See I. Lianos, Competition Law for a Complex Economy., (2019) 50 *International Review of Intellectual Property and Competition Law (IIC)*, 643–648.

⁸⁷ See also A.-L. Barabási & R. Albert, Emergence of Scaling in Random Networks, (1999) 286 *Science* No. 5439, 509; M. E. J. Newman & J. Park, Why Social Networks are Different from Other Types of Networks, (2003) 68 *Physical Review E*, No.036122 (2003), 1.

⁸⁸ See I. Lianos & B. Carballa-Smichowski, *op.cit.*

⁸⁹ L.C. Freeman, Centrality in Social Networks: Conceptual Clarification (1979) 1 *Social Networks* 215.

computational sociology, and data science to develop new methodologies and metrics to gauge ecosystem power.

IV. CONCLUSION

This short paper examined the emergence of the concept of ecosystems in business studies literature and its transplantation in competition law. This is not a linear process, and a competition law and policy theory of ecosystems is still in the making. The recent more systematic use of the concept in competition law proceedings nevertheless provides some clues as to the possible development of this concept and the effort of conceptual clarification that needs to occur. This should start from a proper legal theory of ecosystems that engages with the goals pursued by the competition law system in question, or more generally the specific regulatory system, and makes use of advances in business studies and economic literature, but also other less influential so far, areas of learning, in competition law, such as advanced social network analysis and computational sociology, to make sense of ecosystems dynamics. A broader law and political economy perspective will enable public authorities to understand better the power relations within or outside a specific business ecosystem, and to think creatively about remedies to competition law-related ecosystem problems, that unlock social value and may thus benefit all ecosystem stakeholders, but also the public interest at large⁹⁰.

⁹⁰ The protection of the public interest seems to be the overall goal of EU competition law, see Case C-333/21, *European Superleague Company*, ECLI:EU:C:2023:1011, para. 124 (“As follows from the consistent case-law of the Court, the purpose of that provision [Article 102 TFEU] is to prevent competition from being restricted to the detriment of the public interest, individual undertakings and consumers, by sanctioning the conduct of undertakings in a dominant position that has the effect of hindering competition on the merits and is thus likely to cause direct harm to consumers, or which causes them harm indirectly by hindering or distorting that competition”). See also, para. 185.