Ecosystem theories: a help or a hindrance in analysing digital markets?

Word count: 4990

Candidate number: 1087056

Table of Contents

INTRODUCTION **3**

LITERATURE REVIEW **5**

THE CURRENT ANALYTICAL TOOLKIT 5
THE LITERATURE ON ECOSYSTEMS 7
Business ecosystem theory *8*
Innovation ecosystem theory *9*
Platform ecosystem theory *9*
Product ecosystem theory *10*
Jacobides' complementarity theory of ecosystems *10*

EVALUATING THE JACOBIDES THEORY: A CASE STUDY OF AMAZON **12**

REFINING JACOBIDES: INTRA-ECOSYSTEM EXPANSION AND COMPETITION **13**

CONCLUSION **15**

BIBLIOGRAPHY **17**

Introduction

Recent decades have seen the unprecedented rise to prominence of 'superstar' or 'mega' firms. Primarily noted in the United States economic context (Autor et al., 2020; De Loecker et al., 2020; Hall, 2018), this is an understudied global phenomenon (Manyika et al., 2018). While this trend is by no means exclusive to the digital sector, digital superstars (Google, Apple, Facebook, Amazon, and Microsoft (GAFAM), but also Baidu, Alibaba, Tencent and Xiamoi (BATX)) have achieved degrees of scale, scope, and power second to none (Tambe et al., 2020). Combined with their global influence over social and family life, economic activity, and government has become increasingly outsized, with widely documented evidence of harmful practices and abuses of this power, this makes them deserving of particular public, academic and regulatory attention (see e.g., Khan, 2017; Lehdonvirta, 2022; Newman, 2013).

Four key theoretical concepts have traditionally provided high-level causal explanations of the concentration that characterises the digital markets these companies dominate. The enduring relevance and continued use of theories of economies of scale and scope, network effects, and switching costs are testament to their explanatory power. This paper questions not whether these analytical tools are appropriate but whether they *alone* are sufficient and capable of explaining why digital markets have tended towards not just market concentration but expanding multi-market dominance by a small number of players.

One theory that has been gaining traction in recent years is that of ecosystems (see, e.g., Crane, 2019; Jacobides & Lianos, 2021; Jenny, 2021; Kira et al., 2021). The European, American and British competition authorities' major reports differ in their assessments of digital competition in many respects, but all three make heavy -though inconsistent- use of the of ecosystem metaphor (Crémer et al., 2019; U.S. House of Representatives, 2022; Furman et al., 2019). While Khan argues that competition law's problem is enforcement (Khan, 2017), the EU and UK reports suggest entirely new regulatory tools should be developed to address this. The Crémer report for instance stated that "concepts, doctrines and methodologies" need to be "adapted and refined", notably in relation to the previously centrally relied-on concept of market share. Its suggestion that regulators should move away from relying on market share for analysis and should explore the notion of competition for

ecosystems and ‘ecosystem-specific aftermarkets’ make it is crucially important to evaluate the validity and usefulness of the ecosystem concept (Crémer et al., 2019; Elhauge & Geradin, 2011).

Ecosystem theories are inexorably gaining in popularity and prominence, with conferences held on the topic, and courts incorporating it (at least implicitly) in judgments. However, as this paper demonstrates, the ecosystem metaphor has been applied so widely and inconsistently that it can seem devoid of meaning. Such is the current state of confusion and lack of discipline surrounding the term’s definition and appropriate use that Krivý has argued it has “become commonplace to the point of ubiquity [such that it] is now a dead metaphor serving as a focal point for a seemingly endless stream of scholarship, punditry and hyperbole around digitalization” (Krivý, 2023). Though slightly more restrained in their criticism, Thomas and Autio (2020) have similarly argued that the theoretical immaturity of ecosystem theory is such that it can only be described as a concept useful for theorising, rather than a construct which lends itself to empirical operationalisation.

If economies of scale and scope, network effects, and switching costs should be supplemented with a theory of ecosystems, it is fundamentally important that this is developed as a theoretically coherent concept rather than an intuitively present but vague portmanteau. This is especially true if the intention is to use it for competition law and digital market regulation where its legal usefulness is directly correlated with its theoretical coherence.

Critically examining the literature on ecosystems alongside the wider and more developed literature theorising digital market concentration, this paper explores whether it is necessary and feasible to develop and adopt a theory of ecosystem power as a ‘cornerstone of platform/digital power’ to (1) understand and (2) better regulate digital markets. Demonstrating how a confined and disciplined ecosystem theory can contribute new dimensions of analysis to the examination of competition between hub firms and dependent firms in platform-based digital markets, it will nevertheless argue that the intuitive temptation to use the ecosystem metaphor more widely should be resisted. Wholesale adoption of ecosystem theories is liable to lead to unhelpful conceptual confusion. Other theories or combinations of theories already provide adequate or better explanations or modes of analysis for the phenomena ecosystem theories could feasibly be applied to.

Literature review

The current analytical toolkit

The propensity for digital markets to tend towards concentration has long been predicted by economists and management academics, even if many of these warnings went unheeded. In the 1990s and early 2000s, monographs were already being published highlighting the power of the combination of (1) network effects, (2) consumer lock-in (switching costs), and economies of (3) scale and (4) scope (Arthur, 1996; Rochet & Tirole, 2003; Shapiro & Varian, 1999). Remarkably, despite the immense change in the digital landscape over the last two decades, these remain the key theoretical pillars relied on today to explain the shape of digital markets (Furman et al., 2019; Haucap & Heimeshoff, 2014).

How economies of scale (Bain, 1954; Krugman, 1980) and economies of scope (Panzar & Willig, 1981) contribute to market concentration has been extensively studied. The Crémer, Furman, and House Majority reports all underline how digital markets by their nature create opportunities for firms to achieve high degrees of both. Many digital products involve zero or extremely low marginal costs while the unique affordances of data creates specific dynamics which often demonstrate increasing returns to scale but can also be rendered useful horizontally across products and markets (Furman et al., 2019; Rubinfeld & Gal, 2016; Shapiro & Varian, 1999). For instance, location data, collected to improve Google Maps experience, is also extremely useful to improving Google Search results and for advertisers buying ads from Google who are seeking to target people living in your area. But while an individual's data is useful, the combined data of millions is several magnitudes more powerful.

Numerous digital markets also involve one- and two-sided network effects, where the value of a product or service to its users increases as more use it. Though these are identifiable outside technology markets (e.g. language, social clubs, or physical marketplaces), there they are more likely to be bounded by (usually physical) constraints and thus have less influence. The theoretical concept was thus primarily developed in relation to telecommunication networks, and has since proven highly applicable to other digital markets (Parker & Alstyne, 2005; Rohlfs, 1974). The particularity of network effects is in how they bestow markets with a natural tendency toward de facto standardization because of their strong positive-feedback

elements. In short, as Katz and Shapiro famously demonstrate, if the competing products in question are proprietary incompatible systems, the market becomes prone to 'tipping'. Thus, one system (usually run by one firm) breaks away and comes to monopolise the market (Katz & Shapiro, 1994). Such is the recognised power of network effects on digital market share that Facebook experienced major internal divisions over how to approach its own strategy for Facebook, Instagram, Messenger, and WhatsApp. An internal memo explicitly noted that social apps have tipping points such that "either everyone uses them, or no-one uses them", fearing that "Instagram would hit a tipping point" to Facebook's detriment (Cunningham, 2018 quoted in U.S. House of Representatives, 2022).

The fourth theoretical pillar currently used to explain centralisation in digital markets is switching costs. These create lock-in effects for consumers with respect to a product when they reach a certain threshold (Arthur, 1996; Haucap & Heimeshoff, 2014). Although this can be understood as a subset of network effect theory or as falling within the wider category of barriers to entry to new firms (alongside economies of scale and capital constraints), switching costs are an important theoretical component to understanding why digital markets are so often uncompetitive. The Furman report provides a useful list of examples of switching costs: loss of personal data, loss of reputation (Hesse et al., 2022), anti-competitive terms, technical barriers, tying of services, and customer inertia (Furman et al., 2019). Switching costs and lock-in can be divided into two categories: systemic and artificial. The systemic variety is generally caused by factors such as technical non-interoperability or non-compatibility between systems (Katz & Shapiro, 1994) and consumer behaviour including status quo biases (Jenny, 2021). The more artificial variety occurs when companies make deliberate choices which thwart interoperability, make multihoming or leaving platforms/systems challenging and costly, or make the opportunity cost of leaving the platform too high for rational actors to do so. Pernicious examples include restricting data access and limiting data portability (Lehdonvirta, 2022).

We thus already possess many of the theoretical tools necessary to understand the dynamics at play in digital markets and thus to explain why they are so prone to high degrees of market concentration. These fail, however, to fully explain how it has come to be that a small number of extraordinarily large and powerful companies dominate not just one but many digital and digital-adjacent industries and markets, leveraging that power into continuous vertical and horizontal expansion. Ecosystem theories, which can be used to characterise the interactions

between the multiple actors operating in a certain context (e.g. on a platform like Amazon Marketplace) or to describe single firms' multi-product offerings, have been sought out as a further analytical tool to add to the arsenal.

The literature on ecosystems

The OED defines an ecosystem as "a biological system composed of all the organisms found in a particular physical environment, interacting with it and with each other" (Oxford English Dictionary, 2023). Generalizing the term, we can define an ecosystem as 'a system composed of all the actors found in a particular context, interacting with it and each other'. The idea of ecosystem theory is that it can provide a framework to describe and analyse a hugely important feature of many contexts: that actors exist in webs of interconnected dependencies.

However, the metaphor's ubiquitous applicability is both its power and its weakness, making it is extremely malleable applicable not only to many contexts but also to each of their many layers and dimensions. This makes developing a general theory of ecosystems, as some seem to seek to do, impossible and counterproductive. Instead, it calls for more disciplined and context-specific theorisations to be developed. Aspects of different ecosystem theories can be drawn on to use in others, but a degree of intellectual humility and an explicit recognition that a more focused approach is more productive are sorely needed.

The single biggest challenge to the usefulness of the ecosystem as a theoretical concept is the overwhelming lack of clarity as to its definition. The literature on 'ecosystems' uses the term to refer to often wildly different things while failing to clearly distinguish between different intended application. While Jacobides et al. suggest this is because "[s]cholars have emphasized different aspects of an ecosystem depending on the unit of analysis", this underplays the general state of inconsistency in the term's use. Four dominant categories of ecosystem theory can be identified from the literature. They share many influences, but discipline is often lacking. Some theorists fail to explicitly identify their theory's intended scope or context of application, while others are not sufficiently rigorous in how they build on previous theorising. These issues are due in large part to the inherent malleability and too-easy applicability of an ecosystem lens.

I explain why undisciplined applications of ecosystem theories are a mistake but suggest recent contributions by Jacobides and his collaborators represent a promising path towards the development of a useful narrow theorisation of ecosystem power for applicability to digital markets. I demonstrate how this can help us examine a specific undertheorized element of Big Tech firms' relentless expansion: the competition between hub firms' multi-product offerings and firms dependent on their platforms.

Business ecosystem theory

The most prominent in academic work, business ecosystem theory has largely been developed by management academics. Initially pioneered by Moore, it draws a new metaphor for competition and interaction between firms (Moore, 1993, 2006). Rather than conceiving of firms as members of a single industry, they are viewed as members of a multi-industry economic community of interacting actors (suppliers, distributors, outsourcing firms, producers of complementary products and services, etc.) that all affect each other (cooperatively and competitively) and the creation of each other's offerings through their activities. This ecological theory of business is intended for universal application: Moore wanted to promote a paradigm shift in how managers and researchers think about competition and inter-business interaction generally (Moore, 1993).

Further contributions underline the key role of "hub" or "keystone" firms as quasi-managers of business ecosystems and as the providers of ecosystem stability by coordinating visions and standards. Iansiti and Levien conspicuously note that technology companies stand out for the way they operate as the hub of uniquely large and complex 'ecosystems' involving thousands or even millions of other organizations (Iansiti & Lakhani, 2017; Iansiti & Levien, 2004). Moore later followed in highlighting the role of leading firms, providing the first theorisation of actor power in business ecosystems. Noting the potential for powerful leaders within ecosystems to engage in competition-limiting behaviour, he implicitly recognises the relevance this theory has with respect to tech products, already using the Apple iPod as his illustrative example of a 'business ecosystem' in 2006. Centrally oriented around the iPod, this ecosystem also incorporates companies that licence music through iTunes, companies that make physical accessories for iPods, and consumers who purchase and listen to music on iPods (Moore, 2006).

Moore advocated strongly for competition regulators "to recognize the ecosystem form, appreciate its nature, structure, and operation". He noted that "business ecosystem leadership" is hard to identify, and that as opposed to markets, "traditional economic theory does not focus on business ecosystems as a distinct form of organization and does not provide conceptual templates that can be used to detect, inspect, and assess business ecosystems". Given Big Tech firms' documented anti-competitive practices, Moore's early call for the development of ecosystem theory (including 'business ecosystem failures') as a tool for competition policy was prescient. His contributions, though influential, are more treatises calling for a paradigm shift than they are conceptual frameworks for a new theory.

Innovation ecosystem theory

Innovation ecosystem theory has a different focus, illustrating how easily the ecosystem metaphor can be applied to diverse questions and contexts, opening up possibilities for confusion and misapplication. It examines how interdependent players that create components and complementary products and services for a focal innovation interact to "combine their individual offerings into a coherent, customer-facing solution" (Adner, 2006). This ecosystem concept seeks to capture the interplay between a core product, its components, and its complements which together create customer value. Focusing on the core product and how the extent to which firms cooperate and align themselves through different arrangements will affect their capacity to innovate and create value for the end customer, this theorisation is not relevant for our purposes. Adner's strictly structural approach to theorising ecosystems, however, is valuable (Adner, 2017).

Platform ecosystem theory

Platform ecosystem theory takes platforms' specific affordances to merit a proprietary narrower ecosystem theory focusing on the relationships and interdependencies between platform 'sponsors' and their complementors. The platform ecosystem comprises the products, services, or technologies which act as a 'platform' upon which external innovators develop their own complementary products, services, and technologies (Gawer & Cusumano, 2014). This ecosystem theory takes the platform as a its central organising feature, with peripheral firms connected to the central platform, creating a 'semi-regulated' ecosystem primarily coordinated by the platform sponsor. Benefiting from its narrower scope of

application, platform ecosystem theory comes closer to providing an applicable construct. It however also lacks a concrete conceptual foundation, leaving it lacking in real analytical power.

Product ecosystem theory

Product ecosystem theory differs markedly from the above three which, despite their different focuses, adopt an actor-centric lens. The least prominent theory in academic literature, it is the most aligned with the use of the ecosystem metaphor in wider public discourse. Focused on single firms' ecosystems of products, the basic idea was clearly defined by Bourreau in 2020 as "lines of products and services linked through shared functionalities, which provide benefits to the consumers when used together" (Bourreau, 2020). Typically forming part of a single firm's offering, these benefit from technological linkages (often made possible through the unique nature of software and data) which increase the complementarity between them such as Apple's hardware and software ecosystem or Google's search engine ecosystem (Condorelli & Padilla, 2024; Tambe et al., 2020). While it might intuitively appear to provide an important new way of studying the horizontal expansion of mega firms, product ecosystems can in fact already be evaluated within the existing theoretical framework of economies of scope. While the terminology of product ecosystems appropriately emphasises the importance of synergies and inter-product relationships, it does not add anything radically new that cannot be incorporated into our existing conceptual arsenal.

Jacobides' complementarity theory of ecosystems

Jacobides, in collaboration with Cennamo, Gawer, and Lianos has sought to develop and apply a more discriminating structural theory of business ecosystems (Jacobides et al., 2018, 2020; Jacobides & Lianos, 2021). It too is focused on actor-level ecosystems, but it benefits from more extensive conceptual grounding. Using of complementarity as its central theoretical foundation, it is sufficiently developed so as to be empirically operationalised.

Jacobides' ecosystems are defined as 'a distinct organizational form' defined by the structural presence of complementarities, i.e. where the value or utility of one good or service increases as a result of the availability or consumption of another good or service. They focus on unique complementarities (where the value of A can only be achieved or maximised with B)

and ‘supermodular’/Edgeworth complementarities (where more of A makes B more valuable). Ecosystems are thus defined as “a set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully hierarchically controlled”. An illustrative example is provided:

> In the example of an OS platform/app ecosystem, the app and the platform have a unique complementarity in the sense that the app does not function without the OS (unique complementarity, unidirectional, as the OS operates without most apps); and supermodular complementarity, as the presence of apps increases the value of the OS, and (possibly) the breadth of the OS installation increases the value of the app. (Jacobides et al., 2018)

Unlike in the business ecosystem model, generic complementarities (like electricity) are excluded as they do not give parties any vested interest to align and act as a group. This helpfully restricts the scope of the theory. What makes these ecosystems unique, and worth theorising in their own right, is how the non-generic nature of the complementarities involved inherently entails a degree of customization through non-fungible investment. This establishes different degrees of commitment to the ecosystem for different products, generating product and/or actor lock-in to ecosystems, breeding relationship dynamics with differing levels and directions of dependencies, which can be studied, including for the purposes of competition policy (Jacobides et al., 2018). This theory thus provides a framework for examining how platforms (widely defined as hub products, including e.g. Nespresso pods as well as Amazon Marketplace or Google Search) provide the foundation for an ecosystem of other actors. The use of the concept of complementarity to ground the theory thus bestows it with the theoretical concreteness others lack.

Evaluating the Jacobides theory: a case study of Amazon

Although they suggest it applies more broadly, the ecosystem theory developed by Jacobides, and his collaborators is in many ways inspired by, and an explicit reaction to, Big Tech's extraordinary growth and breadth and the specific features of their business models whose core is shaped around their multi-actor nature. They characterise GAFAM firms as 'digital ecosystems' with a specific core product or service (e.g. marketplace for Amazon, search engine for Google, social network for Facebook, hardware and software for Apple) supplemented by further 'multiproduct scope' (Jacobides & Lianos, 2021).

Applying the complement-focused definition of ecosystems strictly, Jacobides et al. (2020) initially argued that Amazon Marketplace prima facie only exhibits generic supermodular complementarities as there is no significant co-specialization involved in delivering the service. Apple iOS or Amazon Alexa developers, as a counterexample, produce apps inherently tied to the platform through what Cutolo & Kenney (2021) would call 'artifactual power'. These fall more straightforwardly within the complement-focused definition because they are explicitly designed around/for the platform (via coding language, design, etc.). Unlike tied-in app developers, a seller selling on Amazon in theory does not have to fundamentally change the way they sell to list on Amazon or any other marketplace. They may have to re-list items, but the act of selling and what they sell remains identical. Following this logic, Amazon Marketplace should be classed a non-ecosystemic product/platform.

Empirically and intuitively, however, Amazon's Marketplace constitutes a textbook example of an ecosystem (see e.g. Kenney et al., 2021). It depends on its third-party vendors, and they depend on it despite their theoretical freedom to leave. Its supremacy in online retail, achieved primarily through a combination of network effects and logistical efficiency, mean vendors have no real choice to exit Amazon as it offers the least costly means of selling online (Cutolo & Kenney, 2021; Kenney et al., 2021). This is compounded by the fact that although many Amazon vendors could in theory sell elsewhere, many grow their businesses within the Amazon paradigm, structuring them and investing in them in such a way as to optimise for Amazon-based selling. Amazon's deliberate design choices, for instance making reputation portability impossible or imposing 'most favoured nation' clauses on sellers

(Hesse et al., 2022) represent further non-structural factors tying sellers into the Amazon Marketplace 'ecosystem' in ways that fall outside the narrow version of this theory.

A definition of ecosystems which focuses on product modularity is thus too narrow, only capturing cases where complementors design an integrated product (software of complementary hardware). Jacobides et al. (2020) recognise this, suggesting hub firms' ability to "transform generic complementarities into specific ones" means we should instead "assess how "ecosystemic" a specific collaborative arrangement is" and should focus on investment fungibility rather than product modularity (Jacobides et al., 2020). This is welcome but requires further exploration and careful articulation. If ecosystemicity is to be understood as a matter of degree rather than kind, it will have downstream consequences, especially if it is to be incorporated into legal analysis in the competition context (see Jacobides & Lianos, 2021).

But this ecosystem theory, insightful as it is, is for the most part an advanced contribution to the switching cost/lock-in literature. At its core, it involves evaluating switching costs in terms of the extent to which different actors are able to act autonomously and exit ecosystems by examining the fungibility of their investment made while part of the hub platform's ecosystem. We thus again find ecosystem theory to be more of a case of using an ecosystem lens to contribute to an already developed topic of study than a topic in its own right.

Refining Jacobides: intra-ecosystem expansion and competition

I propose a refinement of Jacobides' ecosystem theory which explores product and actor relationships, opening a specific opportunity for analysis of an under-theorised question. By analysing the ecosystemicity of a firm's multi-product offering and situating these products in relation to other ecosystem actors, I argue we can examine hub firms' expansionary strategies in terms of intra-ecosystem competition. In line with the 'ecosystem as structure' approach advocated by Adner (2017), this requires an adaptation of Jacobides et al.'s theory, integrating the evaluation of hub firms' multi-product offerings into the wider multi-actor-focused ecosystem structure. This narrow ecosystem theory supplements the traditional theories used to analyse digital markets which have so far failed to provide tools to investigate how

powerful hub firms so often expand into new markets in ways that compete with ecosystem participants (e.g. Apple with Spotify and Amazon Basics with third party sellers). A case study of Amazon Marketplace can help illustrate the benefits of this theory.

First, we must understand the complementarities at play within multi-product offerings. Amazon has designed a number of products to have unique and supermodular complementarities with Amazon Marketplace. Consumer-oriented offerings include Amazon Kindle, Amazon Basics, and Amazon Prime, while seller-oriented ones include Fulfilment by Amazon, Amazon Warehousing and Distribution, and Supply Chain by Amazon. These exhibit unique complementarities: all these products would be largely worthless without the existence of Amazon Marketplace given how much it has defined their design. Meanwhile, supermodular complementarities are also clearly present in the sense that they all increase the value of Amazon Marketplace (and vice versa) for the respective parties. This is important because it shows how the dynamics at play represent something more than Amazon simply cross-selling and cannot be explained only using economies of scope.

Using the same analytical method as would be applied with respect to other product-actor pairings, Jacobides' theory can be extended to develop an analysis which includes the ecosystem hub firm's complementary suite of products and evaluates how they compete with other ecosystem actors and their products. Google Maps provides a simple example.

Examining Google Maps as we would the product of a separate firm, for the sake of analysis, we are able to consider its position in the Google Search ecosystem in much the same way as we would, for instance, Yelp's. An examination of how Google Search treats Yelp compared to Google Maps enables us to examine questions about self-preferencing and anti-competitive practices by the hub firm. Using this ecosystem-based analytical framework, we can therefore seek to identify which practices might be competitively advantageous by virtue of their placement in the ecosystem and the existence of economies of scope without being problematic (e.g. the convenience of having the same account across Google products) versus those that represent abuses of power by what the DMA calls 'gatekeeper' firms (e.g. Google Search de-listing Yelp or artificially putting it below links to Google Maps)

The theory can also be applied to Amazon, including to demonstrate where competition issues do and do not arise across a mega firm's multi-product offering. Amazon Mechanical

Turk or AWS, for instance, though important parts of Amazon's portfolio, have no real complementarities with Amazon Marketplace. They are thus not relevant to competition-focused analysis of Amazon's practices with respect to Amazon Marketplace. Such an analysis would instead want to focus on Amazon Kindle, Amazon Prime or Amazon Basics, which complementarity evaluation shows occupy different roles in the Marketplace ecosystem, some of them warranting scrutiny. Whereas Prime might not be problematic, for instance, the ecosystem competition between Amazon Basics and third party sellers might be when Amazon delists them. This much more restrictive use of ecosystem theory can thus help explain an aspect of digital markets that has not yet been theorised: how ecosystem hub firms can gain immense competitive advantage in new markets which operate within or partly within the reach of their ecosystems courtesy of their extreme influence over these.

Conclusion

Despite ever-increasing interest in the use ecological metaphors to explain firm relationships, four major issues arise when we try to use them to supplement existing theory in the analysis of digital markets.

First: over-ambition and indiscipline. The attraction of using an ecosystem framing to generate a 'theory of everything' to explain Big Tech firms' dominance must be resisted. Appealing as it may be, the complexity of the processes and forces in action are such that these firms' scale, reach and dominance can only be evaluated by mobilising a combination of conceptually robust theories. A useful ecosystem theory is one that can be operationalised thanks to a well-defined conceptual grounding and combined with these for a wider multidimensional understanding of the why and how of digital markets.

Second: a lack of theoretical grounding. Apart from Jacobides' contribution, most ecosystem theories are lacking in this regard. As I have demonstrated, building on Jacobides et al.'s work, a conceptually grounded ecosystem theory can be useful in evaluating intra-ecosystem competition. In doing this, it can also help explain why ecosystem hub firms are able to benefit from the power they derive by virtue of being hubs to expand into new markets, some of which they then come to dominate. Such a theory, focused in application and enabling the

analysis of the unique nature of relationships in and across digital markets, is the main way ecosystem theories can usefully contribute to scholarship in this area.

Third: the diversity and universality paradox. The simultaneous use of different ecosystem metaphor to refer to different theories and concepts in the same area easily leads to confusion. Moore's business ecosystem theory/lens differs substantially from Adner's innovation ecosystem theory, and both are even further away from the widespread use of the ecosystem metaphor to describe tech mega firms' linked multi-product offerings. For that reason, I suggest that in academic work at least, a first step is to move away from describing multi-product offerings as ecosystems. As this paper demonstrates, they can usefully be understood as parts of a larger structural ecosystem, but we should follow Adner's advice in pushing against 'ecosystem-as-affiliation' approaches.

Finally, as this paper has demonstrated, many insights provided by ecosystem theories can be better understood as applying an ecosystem lens to contribute to the major theoretical tools already in wider use, notably switching costs, lock-in, and economies of scope. Rather than looking for one new big theory, a holistic understanding of digital markets calls for the methodical application of a wide range of small but well-defined theories. These include, but are not limited to, the increasing financialization of the economy (see e.g. Epstein, 2005; Foster & McChesney, 2012), the notion of 'bigness' as an inherent source of power (Edwards, 1955), and studies into how unprecedentedly fast digital markets develop and are disrupted and the effect this might have on market concentration.

Bibliography

Adner, R. (2006, April 1). Match Your Innovation Strategy to Your Innovation Ecosystem. *Harvard Business Review*. https://hbr.org/2006/04/match-your-innovation-strategy-to-your-innovation-ecosystem

Adner, R. (2017). Ecosystem as Structure: An Actionable Construct for Strategy. *Journal of Management*, *43*(1), 39–58. https://doi.org/10.1177/0149206316678451

Arthur, W. B. (1996). Increasing Returns and the New World of Business. *Harvard Business Review*, *74*(4), 100–109. Business Source Ultimate.

Autor, D., Dorn, D., Katz, L. F., Patterson, C., & Van Reenen, J. (2020). The Fall of the Labor Share and the Rise of Superstar Firms*. *The Quarterly Journal of Economics*, *135*(2), 645–709. https://doi.org/10.1093/qje/qjaa004

Bain, J. S. (1954). Economies of Scale, Concentration, and the Condition of Entry in Twenty Manufacturing Industries. *The American Economic Review*, *44*(1), 15–39.

Bourreau, M. (2020, December 3). Some Economics of Digital Ecosystems. *Hearing on Competition Economics of Digital Ecosystems*. OECD. https://one.oecd.org/document/DAF/COMP/WD(2020)89/en/pdf

Condorelli, D., & Padilla, J. (2024). Data-Driven Envelopment with Privacy-Policy Tying. *The Economic Journal*, *134*(658), 515–537. https://doi.org/10.1093/ej/uead090

Crane, D. A. (2019). Ecosystem Competition and the Antitrust Laws. *Nebraska Law Review*, *98*(2), 412–424.

Crémer, J., de Montjoye, Y.-A., & Heike, S. (2019). *Competition policy for the digital era*. Publications Office of the European Union. https://data.europa.eu/doi/10.2763/407537

Cunningham, T. (2018). *Possible End States for the Family of Apps*. Facebook (memorandum provided to the Democratic Majority of the Subcommittee on Antitrust, Commercial and Administrative Law of the Committee on the Judiciary of the U.S. House of Representatives).

Cutolo, D., & Kenney, M. (2021). Platform-Dependent Entrepreneurs: Power Asymmetries, Risks, and Strategies in the Platform Economy. *Academy of Management Perspectives*, *35*(4), 584–605. https://doi.org/10.5465/amp.2019.0103

De Loecker, J., Eeckhout, J., & Unger, G. (2020). The Rise of Market Power and the Macroeconomic Implications. *The Quarterly Journal of Economics*, *135*(2), 561–644. https://doi.org/10.1093/qje/qjz041

Democratic Majority of the Subcommittee on Antitrust, Commercial and Administrative Law of the Committee on the Judiciary of the U.S. House of Representatives. (2022). *Investigation of Competition in Digital Markets: Majority Staff Report and Recommendations* (117–8). https://democrats-judiciary.house.gov/uploadedfiles/competition_in_digital_markets.pdf

Edwards, C. D. (1955). Conglomerate Bigness as a Source of Power. *National Bureau Committee for Economic Research*, *Business Concentration and Price Policy*. http://www.nber.org/books/univ55-1

Elhauge, E., & Geradin, D. (2011). *Global competition law and economics* (2nd ed). Hart publishing.

Epstein, G. A. (Ed.). (2005). *Financialization and the world economy*. Edward Elgar.

Foster, J. B., & McChesney, R. W. (2012). *The endless crisis: How monopoly-finance capital produces stagnation and upheaval from the USA to China*. Monthly Review Press.

Furman, J., Coyle, D., Fletcher, A., McAuley, D., & Marsden, P. (2019). *Unlocking digital competition, Report of the Digital Competition Expert Panel*. HM Treasury. https://doi.org/10.17639/wjcs-jc14

Gawer, A., & Cusumano, M. A. (2014). Industry Platforms and Ecosystem Innovation. *Journal of Product Innovation Management*, *31*(3), 417–433. https://doi.org/10.1111/jpim.12105

Hall, R. (2018). *New Evidence on the Markup of Prices over Marginal Costs and the Role of Mega-Firms in the US Economy* (w24574; p. w24574). National Bureau of Economic Research. https://doi.org/10.3386/w24574

Haucap, J., & Heimeshoff, U. (2014). Google, Facebook, Amazon, eBay: Is the Internet driving competition or market monopolization? *International Economics and Economic Policy*, *11*(1–2), 49–61. https://doi.org/10.1007/s10368-013-0247-6

Hesse, M., Teubner, T., & Adam, M. T. P. (2022). In Stars We Trust – A Note on Reputation Portability Between Digital Platforms. *Business & Information Systems Engineering*, *64*(3), 349–358. https://doi.org/10.1007/s12599-021-00717-9

Iansiti, M., & Lakhani, K. R. (2017). Managing Our Hub Economy: Strategy, Ethics, and Network Competition in the Age of Digital Superpowers: Harvard Business Review. *Harvard Business Review*, *95*(5), 84–92.

Iansiti, M., & Levien, R. (2004). Strategy as ecology. *Harvard Business Review*, *82*(3), 68–78, 126.

Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, *39*(8), 2255–2276. https://doi.org/10.1002/smj.2904

Jacobides, M. G., Cennamo, C., & Gawer, A. (2020). Distinguishing between Platforms and Ecosystems: Complementarities, Value Creation, and Coordination Mechanisms. *Working Paper*, *under review*. https://www.jacobides.com/_files/ugd/0b15b1_7e0678d2815541bb920c77ec41e4d305.pdf

Jacobides, M. G., & Lianos, I. (2021). Ecosystems and competition law in theory and practice. *Industrial and Corporate Change*, *30*(5), 1199–1229. https://doi.org/10.1093/icc/dtab061

Jenny, F. (2021). Competition law and digital ecosystems: Learning to walk before we run. *Industrial and Corporate Change*, *30*(5), 1143–1167. https://doi.org/10.1093/icc/dtab047

Katz, M. L., & Shapiro, C. (1994). Systems Competition and Network Effects. *Journal of Economic Perspectives*, *8*(2), 93–115. https://doi.org/10.1257/jep.8.2.93

Kenney, M., Bearson, D., & Zysman, J. (2021). The platform economy matures: Measuring pervasiveness and exploring power. *Socio-Economic Review*, *19*(4), 1451–1483. https://doi.org/10.1093/ser/mwab014

Khan, L. M. (2017). Amazon's Antitrust Paradox. *The Yale Law Journal*, *126*(3), 564–907.

Kira, B., Sinha, V., & Srinivasan, S. (2021). Regulating digital ecosystems: Bridging the gap between competition policy and data protection. *Industrial and Corporate Change*, *30*(5), 1337–1360. https://doi.org/10.1093/icc/dtab053

Krivý, M. (2023). Digital ecosystem: The journey of a metaphor. *Digital Geography and Society*, *5*, 100057. https://doi.org/10.1016/j.diggeo.2023.100057

Krugman, P. (1980). Scale Economies, Product Differentiation, and the Pattern of Trade. *The American Economic Review*, *70*(5), 950–959.

Lehdonvirta, V. (2022). *Cloud empires: How digital platforms are overtaking the state and how we can regain control*. The MIT Press.

Manyika, J., Ramaswamy, S., Bughin, J., Woetzel, L., Birshan, M., & Nagpal, Z. (2018). *'Superstars': The dynamics of firms, sectors, and cities leading the global economy*. McKinsey Global Institute. https://www.mckinsey.com/~/media/mckinsey/featured%20insights/innovation/superstars%20the%20dynamics%20of%20firms%20sectors%20and%20cities%20leading%20the%20global%20economy/mgi_superstars_discussion%20paper_oct%202018-v2.pdf

Moore, J. F. (1993, May 1). Predators and Prey: A New Ecology of Competition. *Harvard Business Review*. https://hbr.org/1993/05/predators-and-prey-a-new-ecology-of-competition

Moore, J. F. (2006). Business Ecosystems and the View from the Firm. *The Antitrust Bulletin*, *51*(1), 31–75. https://doi.org/10.1177/0003603X0605100103

Newman, N. (2013). The Costs of Lost Privacy: Consumer Harm and Rising Economic Inequality in the Age of Google. *William Mitchell Law Review*, *40*, 849.

Oxford English Dictionary. (2023). *Ecosystem, n.* Oxford University Press; Oxford English Dictionary. https://doi.org/10.1093/OED/4710651519

Panzar, J. C., & Willig, R. D. (1981). Economies of Scope. *The American Economic Review*, *71*(2), 268–272.

Parker, G. G., & Alstyne, M. W. V. (2005). Two-Sided Network Effects: A Theory of Information Product Design. *Management Science*. https://doi.org/10.1287/mnsc.1050.0400

Rochet, J.-C., & Tirole, J. (2003). Platform Competition in Two-Sided Markets. *Journal of the European Economic Association*, *1*(4), 990–1029. https://doi.org/10.1162/154247603322493212

Rohlfs, J. (1974). A Theory of Interdependent Demand for a Communications Service. *The Bell Journal of Economics and Management Science*, *5*(1), 16. https://doi.org/10.2307/3003090

Rubinfeld, D. L., & Gal, M. S. (2016). Access Barriers to Big Data. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2830586

Shapiro, C., & Varian, H. R. (1999). *Information rules: A strategic guide to the network economy*. Harvard Business School Press.

Tambe, P., Hitt, L., Rock, D., & Brynjolfsson, E. (2020). *Digital Capital and Superstar Firms* (Working Paper 28285; NBER Working Paper Series). National Bureau of Economic Research. http://www.nber.org/papers/w28285

Thomas, L. D. W., & Autio, E. (2020). Innovation Ecosystems in Management: An Organizing Typology. In L. D. W. Thomas & E. Autio, *Oxford Research Encyclopedia of Business and Management*. Oxford University Press. https://doi.org/10.1093/acrefore/9780190224851.013.203