Ecosystem theories of harm: analysing competitive constraints and entrenchment

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Key points

- I argue that markets with ecosystems come with unique competitive dynamics and that mergers involving an ecosystem require tailored theories of harm.
- I define ecosystems as firms that consist of components with strong complementarities and a governance system that manages network effects, scope economies, and learning effects. Following this definition, I identify two 'ecosystem theories of harm'.
- First, I adapt the unilateral effects theory from horizontal mergers to ecosystems, where firms exert an actual or potential competitive constraint not just at the product layer (i.e. separate relevant markets), but also as 'substitute complementarities' and 'capabilities' at the wider ecosystem layer.
- Second, I adapt the entrenchment theory of harm to ecosystem mergers, where I separate positive short- and long-run first-order effects (such as consumer convenience and increased innovation) and potentially harmful short-and long-run second-order effects (such as reduced consumer switching and marginalisation of rivals).
- I discuss potential limiting principles that could be placed on these theories of harm to ensure that they are falsifiable and therefore effective in practice, such as replicability, prevalence of third-party services, and trade-offs between consumer benefit and harm.
- I discuss the relevance of ecosystem theories of harm with reference to the recent *Booking/eTraveli* and *Amazon/iRobot* mergers in the EU.

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1. Introduction

The 2023 *Booking/eTraveli* merger prohibition by the European Commission was the first merger prohibition concerning digital platforms. Besides some horizontal concerns, the Commission used for the first time the concept of an 'ecosystem' in its theory of harm in a merger control case.[1] In particular, the Commission raised concerns that the merger would allow Booking to expand its ecosystem and thus entrench its dominant position in the market for hotel online travel agencies (OTA). Concerns about ecosystems have also been raised in areas of competition law besides mergers. Moreover, these concerns may have been relevant in cases where they were not actually raised, such as the *Amazon/iRobot* merger abandoned in 2024.[2]

Mergers in digital markets come with some unique features. Lines between horizontal, vertical, and conglomerate effects are often blurred, and many acquisitions are either driven by or come with concerns around innovation.[3] This has spurred a rethink of merger assessment in digital markets, with theories of harm being adapted to better address novel concerns, particularly those around ecosystems.[4] Some sources consider the ecosystem-based theory, as for example used in *Booking/eTraveli*, a unique theory of harm,[5] while others contend that this is merely a new form of the conglomerate theory of harm.[6] The debate is based not only around the concept, but also the definition of an ecosystem. The Commission has not explicitly defined what it means by an ecosystem, nor by an ecosystem theory of harm.[7] In the academic literature,

[1] *Booking/eTraveli* (Case COMP/M.10615) Commission Decision of 25 September 2023
[2] *Amazon/iRobot* (Case COMP/M.10920) Commission Statement of 29 January 2024
[3] Anne C. Witt, 'Who's Afraid of Conglomerate Mergers?' (2022) 67 The Antitrust Bulletin 208
[4] Viktoria H.S.E. Robertson, 'Digital merger control: adapting theories of harm' (2024) European Competition Journal 1
[5] See e.g., Eliana Garces, Olga Kozlova Guglielmi, and Devin Reilly, 'Ecosystem Theories of Harm in Merger Enforcement: Current Direction and Open Questions' (2024) lpae024 Journal of European Competition Law & Practice 1
[6] See e.g., Olivier Guersent, 'Ecosystem Theories of Harm' (speech at BIAC webinar, online, 21 March 2024)
[7] See e.g. *Booking/eTraveli* (n 1), footnote 229

it is a relatively new concept for which a unifying approach is still lacking.[8] This may lead to ambiguity on how to assess, under the 2004 EU Merger Regulation (EUMR), whether a significant impediment to effective competition (SIEC)[9] is more likely than not[10] in case of a merger concerning ecosystems. Ultimately, the distinguishing characteristics (if any) of an ecosystem and how it affects competition determine whether there are unique theories of harm to be considered.

In this thesis, I argue that competition on markets with ecosystems come with competitive dynamics that are somewhat different from competitive dynamics on other markets, and therefore mergers involving an ecosystem require tailored theories of harm. I start by defining ecosystems as **groups of (possibly independently owned or controlled) components with strong complementarities, with a governance system jointly managing network effects, scope economies, and learning effects**. I argue that competition in markets with ecosystems takes place in two layers: in separate product markets, and in a wider ecosystem layer. I describe how ecosystems can exert a competitive constraint outside the separate product markets, by building a network of capabilities. I label this **substitute complementarities**: at the ecosystem layer, firms compete in developing different complementarities. To better represent the potential for harm to competition within these markets, I propose two tailored theories of harm.

First, I suggest a unilateral effects theory of harm, adapted from single-product horizontal mergers. I describe how an ecosystem merger can lead to softening of the actual or potential competitive constraint exerted on the merged entity at the ecosystem layer. Second, I

[8] Garces (n 5)
[9] Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings [2004] OJ L24/1, Article 2(3)
[10] Case C-376/20 P *European Commission v CK Telecoms UK Investments Ltd*, EU:C:2023:561, para 87. In contrast to such a 'balance of probability' approach, economists would instead generally favour a 'balance of harms' approach, which weighs up both the likelihood and the magnitude of the impact of the merger. See for example Jason Furman, Diane Coyle, Amelia Fletcher, Derek McAuley, and Philip Marsden, 'Unlocking digital competition' (2019) Report of the Digital Competition Panel, March, paras 3.88–3.94.

suggest an adapted entrenchment theory of harm. I describe how an ecosystem merger can lead to entrenchment not only at the product market layer, but also at the ecosystem layer. For the most part, the entrenchment is driven by positive first-order effects, such as consumer convenience from one-stop-shopping (in the short-run) or increased innovation capabilities through economies of scope and data synergies (in the long-run). However, entrenchment can also be driven by negative first-order effects, such as increased consumer inertia; and indeed, lead to negative second-order effects like marginalisation of actual or potential rivals that can no longer compete against the ecosystem's network of capabilities. Assessments of ecosystem mergers must account for such trade-offs. Importantly, however, given that potential harms draw from changes to the market structure and not (or not only) from the conduct of the merged entity, an ability-incentive-effect framework is insufficient in assessing these harms.

The remainder of this thesis is structured as follows. In Section 2, I define an ecosystem and highlight how markets containing an ecosystem having unique competitive dynamics requiring tailored theories of harm. In Section 3, I adapt the unilateral effects theory of harm for ecosystem mergers. In Section 4, I adapt the entrenchment theory of harm for ecosystem mergers. In section 5, I discuss potential limiting principles that need to be applied to ecosystem theories of harm to ensure that they remain falsifiable and hence workable in practical cases. Section 6 concludes.

2. The distinction between platforms, conglomerates, and ecosystems

This section defines ecosystems relative to conglomerates and platforms. Due to fundamental differences in business models, the nature of competition between digital ecosystems may be

different from competition between other types of firms.[11] What distinguishes an ecosystem business model from other, more traditional, types of business models?

A. Reference points

Before providing my definition of an ecosystem, it is useful to introduce some reference points by first defining traditional, conglomerate, and platform business models. To start, a traditional, single-product business model consists of a linear (or 'pipeline') process, transforming inputs into an output product through a (more or less) sequence of activities. At the end of the pipeline, customers purchase the output at a certain price.

In contrast to mergers involving such single-product business models, the Commissions' 2009 non-horizontal merger guidelines define conglomerate mergers as '[…] mergers between companies that are active in closely related markets (e.g. mergers involving suppliers of complementary products or products that belong to the same product range)'.[12] However, while the merger guidelines characterize conglomerates (similar to vertically integrated firms) by complementarities between activities or products, such complementarities may be relatively weak. Generalising the concept of a conglomerate firm beyond the definition in the merger guidelines, such firms can be defined as corporations that are active in several industries, producing products or services that may be unrelated regarding inputs, product development, marketing channels, or technology.[13] Despite the possible unrelatedness of its parts,[14] the overall business model may follow a rationale of internal coherence, such as

[11] See e.g. Frederic Jenny, 'Competition law and digital ecosystems: Learning to walk before we run' (2021) 5 Industrial and Corporate Change 1143.
[12] Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings (2008) C265/07 Official Journal of the European Union 6.
[13] Neil Jacoby, 'The Conglomerate Corporation' (1970) May-June Financial Analysts Journal 35.
[14] Corwin Edwards, 'Conglomerate Bigness as a Source of Power', in National Bureau Committee for Economic Research (eds), *Business Concentration and Price Policy* 331 (Princeton University Press 1955). Jeffrey Williams, Betty Lynn Paez, and Leonard Sanders, 'Conglomerates revisited' (1988) 9 Strategic Management Journal 403 point out an increasing degree of business-relatedness within conglomerate firms.

overhead synergies or diversification of country-specific risks (which goes beyond the definition adopted in the merger guidelines).

Platform businesses bring together and match different parties (e.g., sellers and buyers, subscribers and advertisers, people looking for friends or partners, etc.) to meet, interact or exchange value.[15] A platform business model breaks with the linearity of pipeline models by facilitating value creation by its users through direct and indirect network effects and demand-side complementarities.[16]

Instead of selling output at an optimal (possibly bundled) price, a platform business seeks to optimise the aggregate value created by attracting users. Revenue and profit generation, therefore, follow from stimulating network effects and user interactions. When users belong to different groups (e.g. subscribers and advertisers), a platform orchestrates value creation by these users a multi-sided market.

Note that the fast growth that some platforms exhibit are typically driven by network effects, but economies of scope and learning effects may also play key roles. Scope economies refer to adding new functionalities or new user groups to a platform, to engender new types of interactions. Learning effects refer to the data obtained from adding more users, new user groups and new functionalities, which can be used to increase the quality of matching users and their interactions.[17] Together, network effects, scope economies, and learning effects jointly drive a platform's growth in users (in different sides on a multi-sided platform).

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[15] See e.g. Paul Belleflamme and Martin Peitz, *The economics of platforms* (Cambridge University Press 2021), Paul de Bijl, Nicolai van Gorp, and Gelijn Werner, *Handboek Platformeconomie* (Boom 2023), and Marshall Van Alstyne, Geoffrey Parker and Sangeet Choudary, *Platform Revolution: How Networked Markets are Transforming the Economy, and How to Make Them Work for You* (WW Norton 2016)

[16] Indirect network effects mean that the benefit to users increases as the number of users in a different group increases, such as the value to content viewers as the number of content creators increases. Demand-side complementarities mean that users benefit from being able to combine the use of different services, such as being able to log in to multiple services using a single id.

[17] Andrei Hagiu and Julian Wright, 'Data-enabled learning, network effects, and competitive advantage' (2023) 54 The RAND Journal of Economics 638

Finally, to facilitate meaningful interactions, a platform needs a governance system imposing access conditions and rules for its users. This is in contrast to the governance of conglomerate business models, which are generally limited to optimising overhead synergies and the coordination of bundled sale of separate products.

B. Ecosystems

Ecosystem business models have been defined in different ways. For example, the European Commission defines ecosystems as '[…] in certain circumstances, [...] 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'.[18] Jacobides, Cennamo, and Gawer note, however, that ecosystem business models – in contrast to traditional, conglomerate and platform business models – are characterised by an interaction between closely related components, which may be jointly or independently owned companies.[19] The term comes from biology, referring to the mutual impacts that organisms (here: employees, firms, customers, users, processes, etc.) have on each other in their shared environment. One can distinguish business ecosystems (based on a firm and its environment), innovation ecosystems (centring on a specific innovation and its supporting actors), and platform ecosystems (considering how actors organize around one or several platforms). They share that complementary products, services or technologies – possibly in different industries and markets – have interdependences that are guided by the governance of, and technological interfaces and standards between, the components (or actors). Specifically, Jacobides et. al.

[18] Commission Notice on the definition of the relevant market for the purposes of Union competition law [2024] C/2024/1645, para 104

[19] Michael Jacobides, Carmelo Cennamo and Annabelle Gawer, 'Towards a theory of ecosystems' (2018) 39 Strategic Management Journal 2255

define an ecosystem as '[…] a set of actors with varying degrees of multilateral, nongeneric complementarities that are not fully hierarchically controlled.'[20]

Thus, an ecosystem consists of possibly independent, but at the same time closely attuned and complementary, components. Note that for purposes of merger control, the notion of ecosystems is typically restricted to components under joint ownership, similar to the notion of conglomerates. This interpretation is narrower than the notion of ecosystems as it is commonly understood, in practice as well as in emerging academic literatures. I therefore define ecosystems as the following:

An ecosystem is a group of (possibly independent) actors or components, with a governance system jointly managing network effects, scope economies, scale economies, or learning effects, in a way that includes strong complementarities between the actors or components.

The latter characteristic (regarding complementarities) distinguishes an ecosystem from a 'regular' (digital) platform, in particular when some of the actor or components are platforms themselves.

It is helpful to make the definition of ecosystems more precise. How do conglomerates and ecosystems differ? A conglomerate has subsidiaries, whereas an ecosystem may, similar to platforms, have independent providers. Additionally, taking a company out of a conglomerate need not change its essence, although the risk profile of the portfolio of companies, the allocation of overhead costs and hence the overall profitability may change. Taking a component out of an ecosystem (also if it is under separate ownership), however, may affect the business model of the firm orchestrating the constellation more drastically. In particular,

[20] Ibid.

eliminating an ecosystem component involves parting with specific functionalities, capabilities, complementarities or user groups, rendering the system less attractive for users. Further, the governance differs. In a conglomerate, though ownership is centralised, the governance of components may be independent and need not play an active role in managing complementarities (if any). Instead, the governance is based around using the complementarities to maximise the overall value of the conglomerate. In an ecosystem, ownership may be independent, but governance plays a key role in managing and coordinating network effects, complementarities and learning effects (e.g. through data transfers between the components). Thus, regarding the key role for the governance system, an ecosystem resembles a digital platform. Within ecosystems, the governance tends to be led by a core service, around which the rest of the ecosystem is built.[21]

Schreieck, Ondrus, Wiesche, and Krcmar observe that the difference between platforms and ecosystems is not sharp, as platforms orchestrating interactions between large user groups are often referred to as ecosystems.[22] A case in point is Apple's App Store, a platform orchestrating interactions between huge numbers of app developers and iPhone users.[23] Such an example clearly suggests that ecosystems can be understood as combining network effects, scope economies and learning effects across several platforms. Accordingly, an ecosystem may consist of multiple, (more or less) integrated platforms, so that there are more opportunities to create complementarities in terms of technology, organization, or user experience. Continuing the example, Apple also has other platforms, such as the macOS operating system (leveraging network effects between software developers and users of Mac personal computers, besides selling them), the iOS operating system (leveraging network effects between app developers

[21] Jacobides et. al. (n 19)
[22] Maximilian Schreieck, Jan Ondrus, Manuel Wiesche and Helmut Krcmar, 'A typology of multi-platform integration strategies' (2024) 34 Information Systems Journal 828.
[23] *2023 App Store Transparency Report* (2024), https://www.apple.com/legal/more-resources/docs/2023-App-Store-Transparency-Report.pdf.

and users of mobile devices), the iTunes media player/library (leveraging network effects between content producers and device users), and the Apple TV media player (levering network effects between streaming services and viewers). The integration of platforms creates complementarities such as economies of scale in server use and reduction of overhead costs on data storage. Users benefit by being able to log on to various devices and services with a single ID, meaning that demand side complementarities are created as well. Within an ecosystem, users are able to interact on several platforms within the same environment based with a single ID, recognizable user interfaces, shared data, connected functionalities, and so on.

The discussion above clarifies that ecosystems are characterized by a 'network of capabilities' as implied by its components (such as actors and assets, including data and technologies).[24] Also, whereas digital platforms exhibit strong user lock-in through network effects, this obstacle for competition may be even more pronounced for digital ecosystems consisting of multiple platforms, that double down on user convenience, scope economies and data-driven learning effects.

As an illustration, consider a hotel OTA that also operates OTA services in flights and car rentals. The OTA platforms are interoperable with each other, as well as being interoperable with certain other OTA platforms in taxi services and different types of accommodation. These components form an ecosystem. There are indirect network effects between the users on each of these platforms, between travellers (consumers) and those offering their services on these platforms (service providers). There are demand-side complementarities, as travellers benefit from being able to plan and purchase all of the parts of their travel experience from one ecosystem. There are also supply-side complementarities, as the ecosystem is able to save on overhead costs like customer service and servers. The hotel OTA, as the core offering, governs

[24] Cristina Caffarra, Matthew Elliott and Andrea Galeotti, ' 'Ecosystem' theories of harm in digital mergers: New insights from network economics, part 1' (2023) 5 June VoxEU Column, https://cepr.org/voxeu/columns/ecosystem-theories-harm-digital-mergers-new-insights-network-economics-part-1.

the ecosystem. It manages the network effects, the common costs of customer service and data storage (supply-side complementarities) that allow the ecosystem components to achieve economies of scope, and using the data collected about the preferences of consumers to improve the offerings of the ecosystem (learning effects).

C. Competitive dynamics on markets with ecosystems

The above understanding of ecosystems means that the features that determine the nature of competition on these markets are potentially distinct from competition in other markets, and in that sense unique.

First, competition involving ecosystems concerns competitive advantages created not just by product quality and price in isolation, but also by network effects and complementarities between products. This provides ecosystems with increased capabilities. A capability refers to the ability of a firm to deploy a certain or product characteristic (e.g. a functionality for users, or the usage of data to improve its operations) across markets. The nature of competition then depends on the 'network of capabilities' as implied by an ecosystem's components (such as actors and assets, including data and technologies) and the 'network of products' operated by or within the ecosystem. As Caffarra, Elliott, and Galeotti identify, changes to the network of capabilities available to an ecosystem can create competitive advantages and change the level of competition across markets.[25]

Second, obstacles for competition that emerge in the case of platforms can be more pronounced for ecosystems consisting of multiple platforms, including user lock-in through network effects on the basis of user convenience, scope economies, and data-driven learning effects. While lock-in may follow, in first instance, from consumer benefits, it also creates

[25] Cristina Caffarra, Matthew Elliott, and Andrea Galeotti, 'Ecosystem theories of harm in digital mergers: New insights from network economics, part 2' (*VoxEU Column*, 6 June 2023) available at cepr-org.proxy.library.uu.nl/voxeu/columns/ecosystem-theories-harm-digital-mergers-new-insights-network-economics-part-2

further risks of 'winner-takes-all' or 'winner-takes-most' market outcomes that are already present in markets with platforms.[26]

Third, the role of defining relevant markets is limited. Competitive pressures are not (only) captured by horizontal competition between rivals offering substitutes, or by vertically exerting power over suppliers or customers. Competitive pressure also arises between firms or other types of stakeholders that are not in a traditional (horizontal or vertical) relationship with each other. Lianos and Carballa refer, in this context, to 'architectural power', that is, the ability to reshape an industry architecture to one's own advantage. [27] Moreover, similar to platforms, competitive pressure by ecosystems typically exhibits ongoing change in such architectures, as business models are constantly being adapted by companies. Therefore, the boundaries of markets (and industries) are subject to constant rearrangement. The key factors are the constraints to which the ecosystem as a provider of online platform services is subject.[28] This has shaped the approach of the UK's Competition and Markets Authority (CMA), which can opt to describe the market as comprising the most important constraints the merging ecosystems identified in the analysis of competitive effects, particularly when involving a digital ecosystem.[29] The Commission also recognised in *Booking/eTraveli* that competitive constraint can be exerted from out of market forces, but maintained that these forces are not a sufficient constraint and the dominant undertaking can therefore act independently from its competitors.[30] I suggest that, in markets containing ecosystems, it is often the case that the out of market competitive constraints are sufficient and, indeed, the primary means of competition.

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[26] See e.g. Özlem Bedre-Defolie and Rainer Nitsche, 'When do markets tip? An overview and some insights for policy' (2020) 11 JECLAP 610 and Geoffrey Parker, Georgios Petropoulos and Marshall Van Alstyne, 'Platform mergers and antitrust' 30 Industrial and Corporate Change 1307

[27] Ioannis Lianos & Bruno Carballa, 'Economic Power and New Business Models in Competition Law and Economics: Ontology and New Metrics' (2021) CLES Research Paper Series 3/2021, available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3818943

[28] Pablo Ibáñez Colomo, 'The Draft Digital Markets Act: A Legal and Institutional Analysis' (2021) 12 JECLAP 561

[29] 'Theories of Harm for Digital Mergers – Note by the United Kingdom' (*OECD Competition Round Table*, 16 June 2023) available at one.oecd.org/document/DAF/COMP/WD(2023)58/en/pdf

[30] *Booking/eTraveli* (n 1), para 429

To illustrate, consider the ecosystem based around the hotel OTA described earlier. The components of the ecosystem face horizontal competition from other OTAs that are substitutable. For example, the taxi OTA faces competition from other taxi OTAs. The ecosystem as a whole, however, faces horizontal competition from other ecosystems that do not necessarily have the same components. For example, another ecosystem that combines complementarities and network effects that benefit travellers but is built around a train OTA and offers a smaller accommodation OTA but also offers car rentals, cargo movement, and tickets to tourist attractions. Here, relevant markets are limited in describing the competitive constraints faced by the ecosystem. Competitive constraints are not exerted on the basis of the products but on the basis of the capabilities of the ecosystems. The network effects and complementarities mean that users are locked-in to these ecosystems even more than they would be to the separate platforms.

3. Softening competitive constraints: a unilateral effects theory of harm

In this section, I adapt the unilateral effects theory of harm from horizontal mergers to ecosystem mergers. I explain how competition involving ecosystems can be both between substitutable components of one or more ecosystems (product market layer competition) and between ecosystems as a whole (ecosystem layer competition). I argue that they must both be considered in order to capture the full extent of competition involving ecosystems. I outline how competition on the ecosystem manifests through overlaps between capabilities and complementarities, and requires a different macro level market definition in addition to standard definition of relevant product markets. I suggest that the softening of competitive constraints on the ecosystem level to be considered a unique ecosystem theory of harm, independent of conventional (horizontal, vertical, or conglomerate) theories of harm on the product market level.

A. Product market versus ecosystem layer

Competition involving ecosystems can occur as inter- or intra- ecosystem competition, meaning competition between multiproduct ecosystems and competition between substitutable components of a single ecosystem respectively.[31] Intra-ecosystem competition can also be understood as competition between 'firms generating (mutual) unique or supermodular complementarities'. [32] The latter notion refers to a situation in which more of something, typically a good or an activity (e.g. flight tickets) makes something else, typically a different good or activity (e.g. hotel accommodation) more valuable. An example in the context of platforms and ecosystems is that adding a functionality, or adding a new user group, makes a platform or ecosystem more attractive.

Inter-ecosystem competition, on the other hand, consists of competition between ecosystems exhibiting alternative complementarities, that nevertheless exert competitive pressure on one another.

There are different possible perspectives on this. First, Crane argues that such competitive pressure from complements may happen through the commoditisation of different nodes of a complementary value chain.[33] This refers to cases where ecosystems compete to shape the experience of consumers using the complementary products or services.

For example, consider the ecosystems described in previous example, where two ecosystems consisting of different components with substitutable complementarities compete with each other at the ecosystem layer. Consider that one is dominant in the hotel OTA market, while the other is dominant in the train OTA market. There are complementarities between hotel OTAs and train OTAs. Suppose that a traveller has a fixed willingness to pay for a trip,

[31] Michael G Jacobides and Ioannis Lianos, 'Ecosystems and Competition Law in Theory and Practice' (2021) 30 Industrial and Corporate Change 1199
[32] Jacobides et. al. (n 19), Lianos and Carballa (n 27)
[33] Daniel A Crane, 'Ecosystem Competition and the Antitrust Laws' (2019) 98 Nebraska Law Review 412

and this trip requires the purchase of both train and hotel services. The ecosystem dominant in the hotel OTA market would try aim to differentiate its offering in order to lower the traveller's willingness to pay for trains, while the ecosystem that is dominant in the train OTA market would aim to lower the traveller's willingness to pay for a hotel. In this way, they seek to shape the experience of the consumer to encourage higher spending in the markets they are dominant in.

Alternatively, Jenny suggests that competitive pressure from complements may happen through the use of non-substitute offerings to generate complementarities that are substitutable.[34] This refers to cases where rivalrous ecosystems are viewed by consumers as (imperfect) substitutes for one another as a whole based on the value that they provide, despite some components of the ecosystem not being substitutes or operating on the same market when viewed from a traditional perspective of market definition. I label this **substitute complementarities**.

For example, flight OTAs, hotel OTAs, train OTAs, and car rental platforms belong to different (traditional) product markets. From an ecosystem perspective, however, complementarities between components and network effects on individual platforms engenders substitutability between complementary combinations. Potentially, an ecosystem consisting of a flight OTA and car rental platform may – at certain moments for certain travellers – be a substitute for an ecosystem consisting of a train and hotel OTA, despite the components all being separate markets when viewed individually. This would imply that these ecosystems offer substitute complementarities, despite not offering substitutable products.

This means that there is horizontal competition in two layers: horizontal competition between substitute products and services at the product market layer; and horizontal competition between substitute complementarities at the ecosystem layer. The basis for

[34] Frederic Jenny, 'Ecosystem Theories of Harm' (speech at BIAC Webinar, online, 21 March 2024)

competition between substitute complementarities is the capabilities in the network of the ecosystems. Where these higher-level capabilities overlap, ecosystems are more likely to produce substitute complementarities.

Such competition at the ecosystem layer means that there is a competitive constraint on an ecosystem from other ecosystems with potentially substitutable complementarities. This constraint can be missed when considering competition only as horizontal or vertical, with the possible extension of a conglomerate perspective to allow for leveraging of market power or for competition between given combinations of complementary goods. Therefore, an understanding of competition involving ecosystems must go beyond the relevant markets of the components (product markets) or given combinations of complementary goods. Ecosystem competition may also pertain to the ecosystem layer, based on dynamic and potential complementarities.

Ecosystems with overlapping capabilities exert a direct competitive constraint on each other, even without horizontal overlap at the product market level. Usually, (horizontal) merger analysis considers the acquisition of a certain product or service (and horizontal overlap). Thus, horizontal competition at the level of capabilities is different from the horizontal concerns raised in digital mergers, which include the raising of entry barriers, customer lock-in, input or customer foreclosure[35], and the removal of a rival that could have otherwise grown to exert significant competitive pressure.[36] The concern under this theory is the softening of the horizontal competitive constraint on the merged entity. Unlike Baumol's contestable markets theory,[37] this theory is not subject to assumptions about there being no entry costs or sunk costs, because the rival ecosystem already has the capabilities to be able to offer substitute

[35] 'Theories of Harm for Digital Mergers – Note by the European Union' (*OECD Competition Round Table*, 16 June 2023) available at https://one.oecd.org/document/DAF/COMP/WD(2023)51/en/pdf

[36] Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings [2004] OJ C31, para 37

[37] William J Baumol, 'Contestable markets: an uprising in the theory of industry structure' (1982) 72 American Economic Review 1

complementarities. However, similar to the contestable markets theory, these constraints may not be stable independently, and can require regulatory protection to ensure that they remain on the market.[38]

B. Adapting the unilateral effects theory of harm to ecosystems

Ecosystem mergers combine a horizontal effect pertaining to overlapping capabilities with conglomerate and vertical concerns, based on the combination of network effects and complementarities. This means that the unilateral effects theory of harm must be adapted for the ecosystem context.

In the ecosystem context, this theory of harm can be best understood as the softening of the horizontal competitive constraint on the ecosystem acquiring a target that, despite operating in a different market, exerts a competitive force on the ecosystem. The ecosystem might also use a merger specifically to remove a competitive constraint.[39] This can lead to anti-competitive effects through the (new potential for) conduct of the merged entity as in the horizontal unilateral effects theory.

This likelihood of an impact on competition can be assessed using the capabilities of the acquirer and the target, which is higher when there is significant (potential) overlap of capabilities. Conversely, if there are sufficient overlaps with the capabilities of other ecosystems active post-merger, there might be sufficient competitive constraint on the merged entity such that an impact on competition is less likely.

In the *Booking/eTraveli* merger prohibition, for example, the Commission considered the position of Booking in the hotel OTA market and the position of eTraveli in the flight OTA market to not be replicable.[40] This was a decisive factor for the Commission to decide that the

[38] Jacobides and Lianos (n 31)
[39] See Susan Athey and Fiona Scott Morton, 'Platform Annexation' (2022) 84 Antitrust Law Journal 677 on the acquisition of a multihoming tool by a digital platform.
[40] *Booking/eTraveli* (n 1), paras 272, 465, and 1222

strengthening of Booking's ecosystem was harmful for competition.[41] This 'replicability' approach, however, does not fully account for competitive constraints, as it does not consider the replicability of adding (combinations of) capabilities. It is still possible that other ecosystems, not necessarily active in the flight OTA or hotel OTA markets, would exert sufficient competitive constraint on the merged entity if they are competitors at the ecosystem layer. Alternatively, a smaller platform on a market with complementarities with either the hotel OTA or flight OTA market could merge with an ecosystem with similar capabilities to Booking and/or eTraveli, and exert a competitive constraint without replicating the positions of either.

As another example, the Statement of Objections sent to the parties by the Commission in the abandoned *Amazon/iRobot* merger does not mention the ecosystem theory of harm, focussing instead on a vertical foreclosure theory of harm.[42] As Amazon was not active in the robot vacuum cleaner market, it was not deemed to be in competition with iRobot. Amazon was, however, active in various home appliances markets and had a significant overlap of capabilities with iRobot. According to an ecosystem level unilateral effects theory of harm, iRobot exerted a competitive constraint on Amazon. The extent to which the removal of this constraint would have harmed competition had the merger been approved would depend on the constraint exerted on both Amazon and iRobot by other ecosystems with similar capabilities.

In practice, this theory of harm could lead to different outcomes than would be reached using only the assessment of the product markets – even when extended with vertical and conglomerate impacts such as leveraging. A merger might not lead to anti-competitive effects in specific product markets, but could still lead to anti-competitive effects at the ecosystem level. Additionally, a merger might be even more anti-competitive than indicated by only the product markets.

[41] Guersent (n 6)
[42] *Amazon/iRobot* (Case M.10920) Statement of Objections of 27 November 2023

However, on the other hand, a merger might be anti-competitive at the product market level, but not lead to an impact on competition because the merged entity still faces sufficient competitive constraints at the ecosystem level. Alternatively, such a merger can perhaps even be pro-competitive at the ecosystem level by strengthening an ecosystem and allowing it to compete with a previously dominant rival ecosystem. Similar to the notion of supply substitution, though, this requires that such disciplining should be sufficiently direct so that it does not take a substantial amount of time before the pro-competitive effects are realised. Further, similar to the treatment of collective benefits under sustainability agreements,[43] there must be substantial overlap between consumers at the product market layer facing the negative effects of the merger and at the ecosystem layer gaining the benefits of the merger.

To illustrate, consider the ecosystem based around a hotel OTA described earlier. Suppose there was a merger between such a hotel OTA and a non-dominant train transport OTA. Such a merger might not have anti-competitive effects in the train transport or hotel OTA market, but might reduce contestability of travel ecosystems at the ecosystem layer. This could also mean that the merger is more anti-competitive than indicated by only the product market layer. Alternatively, if a rival ecosystem with similar capabilities (say an ecosystem based around a flight OTA that contains a private accommodation OTA) exerted sufficient competitive constraint, the merger would not lead to harmful effects in either product market due to these constraints. Instead, if the rival ecosystem were dominant in the ecosystem layer, the merger could potentially allow the hotel OTA ecosystem to exert a competitive constraint on the rival ecosystem and thus be pro-competitive.

4. Market structure: an entrenchment theory of harm

[43] Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements [2023] OJ C 259/1, para 584

In this section, I adapt an entrenchment theory of harm to the ecosystem context. I explain how a merger involving an ecosystem can increase the likelihood of a merger potentially leading to entrenchment, which can occur on both the product market layer and on the ecosystem layer. This entrenchment can lead to harmful effects not only by the conduct of the merged firm, but also by consumer behaviour and other inherent market characteristics independent of conduct. These effects can also manifest at both the product market and ecosystem layers.

Not only are these harmful effects more likely to occur from ecosystem mergers, but the existing ability-incentive-effect framework is insufficient for their assessment because of its emphasis on relevant markets and on the conduct of the merged entity. I suggest that the entrenchment theory of harm adopts a different assessment framework when applied to ecosystem mergers, meaning updating the (non-horizontal) merger guidelines with the framework for assessing effects caused by structural characteristics. This includes aspects of consumer behaviour, contestability of the individual relevant markets, contestability of related markets outside the ecosystem, and the contestability of the ecosystem as a whole.

I outline the potential trade-off between short-term gains to consumers and the risk of long-term foreclosure. I also discuss the trade-off between improved product quality through a merger and the need to place an intrinsic value on preventing entrenchment and maintaining the contestability of ecosystems.

A. Entrenchment and ecosystems

The main concern regarding ecosystems, particularly in digital markets, is entrenchment of monopoly power.[44] In *Booking/eTraveli* for example, the Commission raised concerns that the creation of Booking's ecosystem would increase network effects and thus create barriers to

[44] Hans Zenger, 'Theories of Harm for Digital Mergers' (OECD Competition Open Day, Paris, 6 March 2024)

entry and expansion. This would, in turn, entrench Booking's dominant position on the hotel OTA market.[45]

Entrenchment allows a dominant undertaking to use its market power to expand the dominance of its position, make it more difficult for rivals to compete or enter, and lower the contestability of a particular market. This follows not from foreclosure or marginalisation or rivals, but from 'the strengthening of dominance as it fortifies the dominance of the ecosystem, in part because the new services add value to the consumers for which they are complements and in part because they help retain other users for which they are partial substitutes.'[46] Broadly speaking, there are two steps to how ecosystem mergers can lead to harm to competition: first, two or more product or service offerings are combined to make the dominant undertaking stronger, either through lower costs or higher valuation by consumers; secondly, this increased market power leads to competitive harm.[47]

Generally, the mechanisms for competitive harm consist of reduced contestability through increased entry barriers, usually following from first order efficiencies of the merger. Alternatively, as identified by the Commission in *Booking/eTraveli*, the increased entry barriers could instead be the result of factors deviating from competition on the merits, such as brand strength and end-consumer inertia.[48] Marginalisation of rivals is the classic mechanism for entrenchment, but it is not the only mechanism. In markets with ecosystems, mergers can also be used for offensive and defensive entrenchment. Under defensive entrenchment, such as *Booking/eTraveli*, a dominant undertaking extends its ecosystem through the purchase of a substitute to get more market power, even though the target was not a threat. This could potentially illustrate how an ecosystem may aim to hoard capabilities that it may or may not

[45] *Booking/eTraveli* (n 1), para 919
[46] Yves-Alexandre de Montoje, Heike Schweitzer, and Jacques Crémer, 'Competition policy for the digital era' (2019) available at: https://data.europa.eu/doi/10.2763/407537
[47] Zenger (n 44)
[48] *Booking/eTraveli* (n 1), para 209

use, in an attempt to prevent a target firm from developing them independently. Under offensive entrenchment, such as *Adobe/Figma*, the target is a new entrant that does not enter the market against the dominant undertaking, but instead works 'in the shadows' building capabilities to obtain market power.[49] The dynamic nature of digital markets means that a complement today can be a substitute tomorrow.[50]

Defensive and offensive entrenchment is more likely in markets with ecosystems. The increased network effects present in these markets mean that entrenchment is more likely to occur when a merger allows for these effects to be reinforced. The strong complementarities present in these markets mean that defensive entrenchment in particular is easier to achieve, as the increased capabilities lead to more market power in the ecosystem layer. Given that competition on markets with ecosystem, particularly competition in the ecosystem layer, is based around out-of-market constraints, offensive entrenchment is also more likely to occur in these markets.

To illustrate, consider the ecosystem based around a hotel OTA described earlier. This hotel OTA could use a merger to entrench its position on the market. By merging with a flight OTA, for example, it can raise entry barriers and marginalise its rivals. This can be achieved by competition on the merit, such as by efficiencies achieved through the merger, or by means deviating from competition on the merit, such as by leveraging brand identity and consumer inertia. The probability of the entrenchment is more likely, given that the ecosystem it operates strengthens the network effects present on the market. Further, the merger can also lead to defensive entrenchment, since it increases the capabilities available to the ecosystem (or decreases the capabilities available to rivals outside the ecosystem). Finally, the merger can also lead to offensive entrenchment since the flight OTA, given the complementarities with the

[49] *Adobe/Figma* (Case M.11033) Statement of Objections of 17 November 2023
[50] Zenger (n 44)

hotel OTA market and other related markets within the ecosystem, could have been developing capabilities in those markets.

B. Market structure and ecosystems

The competitive harm from entrenchment, regardless of whether the entrenchment is marginalising, offensive, or defensive, does not necessarily depend on the conduct of the merged entity. It is instead often a consequence of the changes to the structure of the market. The creation or enlargement of an ecosystem can lead to reinforcing network effects, creating complementarities, and creating efficiencies for consumers that lead to changes to market characteristics. This can lead to changes in both consumer behaviour and the outlook for rivals.

Consumers benefit from one stop shopping, and this can lead to consumer inertia and a reduction in multi-homing. Rivals may be foreclosed, through having relatively higher costs. Potential entrants may be disincentivised from entering, due to raised entry barriers and lower expected profits. This can lock-in consumers, or incentivise them to remain within the 'walled garden' of service offerings of the merged entity, based purely on changes to the market structure. As discussed in more detail in section 4.D., this means that there is a trade-off between gains from efficiencies and harms from entrenchment.

Alternatively, the anti-competitive changes to market structure can occur through means deviating from competition on the merits. Strong existing brand identity, for example, can lead to changes in consumer behaviour, such as a reduction in multi-homing, after a merger independent of the conduct of the merged entity. This would imply that an assessment of the effects of the merger must not only consider changes to market structure, but also the reasons behind those changes.

To illustrate, consider the ecosystem based around a hotel OTA described earlier. Were this hotel OTA to merge with a flight OTA, entrenchment could occur regardless of the conduct

of the conduct of the merged entity. Consumers might benefit from being able to book hotels and flights from the same ecosystem, which could reduce the prevalence of multi-homing on the flight OTA market. Alternatively, consumers might stop multi-homing not on the basis of the better offerings of the merged entity, but because of the existing brand identity of the hotel OTA. Thus, not only is it necessary to examine changes to market structure, but it is also necessary to examine why those changes occur.

C. Assessment frameworks

The ability-incentive-effect framework is the standard assessment framework of a conglomerate theory of harm. It is the framework used by the Commission in its assessment of both vertical[51] and conglomerate mergers.[52] For conglomerate mergers, the framework is based on whether the merged firm has the ability and an incentive to foreclose competition, and whether this foreclosure has the effect of raising prices or reducing choice for consumers.

This involves defining relevant markets, and articulating a clear foreclosure or exclusion mechanism through which market power can be leveraged from one market to another. Multiple mechanisms for this leveraging have been identified, including tying, bundling, and the raising of rivals' costs. These mechanisms all involve the merged entity engaging in a particular conduct, the effects of which might be harmful to competition.

This framework is insufficient in assessing mergers involving ecosystems, because of its focus on defining relevant markets and on the conduct of the merged entity. This implies that the framework is generally insufficient when it comes to anticompetitive changes in the structure of the market.

[51] Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings [2008] OJ C 265/07, paras 33-77
[52] Guidelines on non-horizontal mergers (n 51), paras 95-118

There has been an increase in the use of conglomerate theories of harm in merger investigations, particularly in the area of digital markets.[53] There has also been an increase in the role played by these theories of harm in merger prohibitions, with conglomerate theories of harm starting to be seen as sufficient for prohibitions.[54] Explanations include the adaptability of conglomerate theories to digital markets, and, indeed, the emergence of (digital) ecosystems.[55] However, given the challenges associated with applying the ability-incentive-effect framework to ecosystems, we suggest a different assessment framework. The focus is not on the **conduct** of the merged entity, but about how the merger affects the **structure** of the market, particularly consumer behaviour and contestability.

Consumer and user behaviour is the main determining factor in the entrenchment of an ecosystem on particular markets. Features such as consumer inertia, the prevalence and ability of consumers to multi-home, and the presence of switching costs are all independent of the conduct of the merged entity, but can affect the extent to which entrenchment of an ecosystem is possible. When consumer inertia is higher, consumers are more likely to stay within the offerings of the ecosystem. This was an argument put forward by the Commission in the *Booking/eTraveli* merger prohibition.[56] Similarly, when switching costs are high, consumers are less likely to switch to alternatives outside the ecosystem. This lock in can lead to a loss of competitive pressure and a reduction in innovation.[57] On the other hand, when consumers are able to, and frequently do, multi-home, entrenchment is less likely.[58] The motivation behind user behaviour, and also the motivation behind its changes, is also useful for the assessment, since it could highlight some of the efficiencies created by a merger, or highlight when a certain

[53] Witt (n 3)
[54] Robertson (n 4)
[55] Robertson (n 4). Witt (n 3)
[56] *Booking/eTraveli* (n 1), para 243
[57] Viktoria H.S.E. Robertson, 'eSports and Digital Ecosystems: An Antitrust Perspective' (2021) 12 JECLAP 591
[58] Eliana Garces, 'Ecosystem Theories of Harm' (speech at BIAC webinar, online, 21 March 2024)

feature deviates from competition on the merit.[59] Since competition in markets with ecosystems is to a large extent determined by out of market forces, it is necessary that consumer behaviour be analysed not only in the markets in which the ecosystem is active, but also those markets with which the ecosystem has actual or potential complementarities.

Similarly, the contestability of markets with ecosystems is affected by an ecosystem merger, and changes the effects that a merger may have regardless of the conduct of the merged entity. Particularly in digital markets, the presence of an ecosystem can lead to increased entry barriers through creating switching costs and/or reenforcing network effects.[60] This does not require particular conduct by the ecosystem, but is a consequence of the market structure. Mergers that lead to the creation of an ecosystem, the strengthening of an ecosystem, or the expansion of an ecosystem into new markets could thus lead to anti-competitive changes to the structure of the market. The assessment framework must account for these changes. Changes to the contestability regarding an ecosystem must be assessed at each layer at which contestability is possible, and where contestability is affected. This could be the contestability of each of the particular relevant product markets, the contestability of related markets with complementarities with the markets on which the merged entity operates, and the contestability of the ecosystem layer as a whole.

To illustrate, consider the ecosystem built around a hotel OTA described earlier.

First, suppose that it merges with a platform that operates on both flight OTA and train transport OTA markets. Both flight and train OTA markets have strong complementarities with hotel OTAs, but not with each other. This platform has a dominant position on the flight OTA market, where multi-homing is common and inertia is low. This platform does not have a dominant position on the train OTA market, where multi-homing is not common and consumer

[59] Garces et. al. (n 5)
[60] Caffarra et. al. (n 24)

inertia is prevalent. After a merger, consumers in the train OTA market are more likely to be locked into the ecosystem than consumers in the flight OTA based on the complementarities with the hotel OTA market, despite the smaller market share. If the merger were to stop consumers from multi-homing on the flight OTA market, however, consumers would be more likely to be locked-in.

Second, suppose that the hotel OTA ecosystem operates also in the flight OTA market, and faces a competitive constraint from a rival ecosystem operating primarily in the train OTA and private accommodation OTA markets. Additionally, a platform has a dominant position on the market for ride sharing, but is unable to abuse its dominant position because the market is very contestable, due to low entry costs, absence of sunk costs, and the technology being available to potential entrants. A potential entrant is a platform that operates on the related market of car sharing. Were the hotel OTA ecosystem to merge with the ride sharing platform, perceived entry costs for the car sharing platform would rise and the contestability of the market would reduce. Additionally, this could lower the competitive constraint exerted on the merged ecosystem from its rival. This would allow the merged ecosystem to abuse its dominant position on the ride sharing market.

Unless the merger assessment framework accounts for these potentially anti-competitive changes to the structure of the market as a result of the merger, ecosystem mergers that lead to harmful anti-competitive effects will not be investigated properly.

D. Efficiencies and trade-offs

A challenge for the assessment of these changes to market structures is that they are often indicators of benefits brought about by ecosystems. Ecosystems are — relative to more traditional business models — typically considered beneficial for consumers, and these benefits may be short-run, in the form of optimised integration of complementary functionality, as well

as medium-run, in the form of accessible innovation.[61] Specifically, user behaviour can be an indicator of efficiencies, and there are pro-competitive reasons for users to choose to remain within an ecosystem. Trust, familiarity, lower search costs, and frictionless experience are all efficiencies of an ecosystem that might determine user behaviour, regardless of the conduct of the merged entity.[62] It is necessary to account for these efficiencies in the assessment of ecosystem mergers.

There needs to be, however, a trade-off between these short-term and medium-term efficiencies on the one hand, and the short-term, medium-term, and long-term harms to competition on the other. Besides the short-term softening of a competitive constraint and the medium-term harms to competition through the means of anti-competitive changes to the structure of the market identified above, van den Boom and Samranchit identify the potential for long-term harm to competition through long-run foreclosure.[63] The mechanism they identify is based specifically on efficiencies achieved by the merged entity. Potential entrants not only face an increased cost in the medium run, but in the long run are competing against a rival that is more efficient and therefore have a lower expected profit. This discourages entry, and allows the merged entity to foreclose competitors in the long run. Despite the uncertainty around the predictions of the medium-term and long-term harms to competition, it is important that this trade-off be made in the assessment of ecosystem mergers.

There is a risk here of penalising merging ecosystems for an 'efficiency offence', or for outcompeting rivals not through foreclosure but merely through offering a better product. This was the major criticism of the Commission's decision in *Booking/eTraveli*.[64] It is true that

[61] Cecilia Nardini and Angelos Stenimachitis, 'Ecosystem theories of harm- a new risk or just a new word?' (*Financier Worldwide*, February 2024) available at https://www.financierworldwide.com/ecosystem-theories-of-harm-a-new-risk-or-just-a-new-word

[62] Garces et. al. (n 5)

[63] Jasper van den Boom and Peerawat Samranchit, 'Digital Ecosystem Mergers in Big Tech — A Theory of Long-Run Harm with Applications' (2021) 13 JECLAP 365

[64] See for example RBB Economics, 'Booking/eTraveli prohibition: flight from the non-horizontal merger guidelines' (*RBB Economics News*, 26 September 2023) available at www.rbbecon.com/news/article/booking-etraveli-prohibition-flight-from-the-non-horizontal-merger-guidelines

ecosystem mergers can lead to efficiencies and better offerings for consumers. It is necessary, however, that these short- and potential long-term benefits be traded off against the weakening of the competitive restraint, the medium term anti-competitive changes to the structure of markets, and the long-term risk of long-run foreclosure.

Table 1 provides an overview of the possible short-, medium-, and long-run benefits and harms of ecosystem mergers—as discussed above.

Table 1 Trade-offs in ecosystem mergers

	Short run	**Medium run**	**Long run**
Benefits	Consumer convenience, efficiencies	Increased innovation	
Harms	Softening of competitive constraints	Anti-competitive changes to market structure	Disincentivised entry and foreclosure

Note: This table provides an overview of the possible short-, medium-, and long-run benefits and harms of ecosystem mergers.

Further, I believe that there is a need to place an intrinsic value on preventing entrenchment, even if that entrenchment is achieved through improvements in product quality. There is an intrinsic value to protecting the contestability of markets. This is true particularly of ecosystems, where the residual nexus of contestability much harder to identify than in the case of platforms, which is in turn harder to identify in the case of simple horizontal, vertical, and conglomerate mergers. The out of market effects and competitive restraints that form the basis of competition between ecosystems mean that contestability is particularly important in preserving the competitive process when dealing with ecosystems. While efficiencies and product improvements are necessary to take into account, sufficient weight must be given in the assessment to the value of preserving contestability in markets with ecosystems.

5. Potential limiting principles

In this section, I discuss potential limiting principles that can be placed on the two ecosystem theories of harm identified above. In order for these theories of harm be workable, it is necessary that they be falsifiable, ensuring that mergers involving an ecosystem that do not lead to anti-competitive effects are not prohibited. These limiting principles help ensure that these theories of harm remain falsifiable. In the absence of these limiting principles, all mergers involving ecosystems would be prohibited.

A true discussion of the necessary limiting principles that must be placed on these theories of harm would require detailed discussion of the nature of enforcement, and is therefore out of the scope of this thesis. This section offers a non-exhaustive list of potential limiting principles that may not all be necessary, nor be collectively sufficient to ensure that the theories of harm are falsifiable, but offer a starting point for further research.

In this section, I discuss the complexity of the assessment of ecosystem mergers and how that lends itself to applying general principles of openness rather than a definitive assessment. Further, I discuss the role of replicability, consumer interaction with the ecosystem, the prevalence of third-party services, and the trade-off between collective benefit and narrow harm.

A. General principles of openness

The ecosystem theories of harm highlighted in this thesis make analysis more complex, given that there are more elements that need to be balanced. The use of more flexible remedies based on general principles of openness, such as obligations for interoperability, data exchange, and open standards, would increase the effectiveness of investigating and protecting against the ecosystem theories of harm.

In the horizontal ecosystem theory of harm, for example, it is necessary to consider competition in both the product market layer and in the ecosystem layer. In the ecosystem

entrenchment theory of harm, it is necessary to balance gains from efficiencies and harms in the short, medium, and long run. Having more elements to balance than in traditional horizontal, vertical, or conglomerate theories of harm means that evaluation of these theories of harm can go in different directions. I suggest that this makes it more challenging to come up with a definitive assessment than it would be using a more traditional reasoning under traditional theories of harm. At the very least, this means that a definitive assessment under the ecosystem theories of harm would take longer than under traditional theories of harm.

This can be problematic, since markets with ecosystems tend to be digital markets, which are extremely dynamic. This means that delays in the assessment and thus in the clearing of a merger could have more drastic effects than in other markets. To illustrate, consider a merger aimed at equipping a hotel OTA ecosystem with the capability to use an artificial intelligence model to predict what destinations and category of hotels a user would like. A delay in clearance might mean that the suggestion algorithm used by the ecosystem has updated and the hotel OTA is longer interoperable with the target artificial intelligence operator. Alternatively, the ecosystem might have in the meantime developed capabilities that increase the impact of the merger compared to when it was notified. It is necessary, therefore, that assessments in markets with ecosystems not take too long.

I suggest that, rather than trying to come up with a definitive assessment, it may make sense to enforce general principles of openness as remedies more quickly. This could restrict the creation of walled gardens by changes to the structure of the market, and increase the overlap of capabilities between ecosystems, thus reducing the softening of competitive constraints.

These general principles of openness would be remedies designed to ensure that the benefits generated by the creation or strengthening of an ecosystem are materialised for consumers without the potential harms. The goal would be to ensure that the increased

capabilities of the merged ecosystem are not available only the ecosystem itself, but can be accessed from outside the ecosystem. Interoperability could ensure that the network effects of a particular product or service are experienced as a whole by the relevant markets at the product layer and by all competing ecosystems at the ecosystem layer, as opposed to by a single ecosystem.[65] Similarly, using open standards (particularly for APIs) and data exchanges as part of remedies could ensure openness and allow for actors outside of the merged ecosystem to benefit from the capabilities and complementarities generated by the merger.

B. Replicability

As described in section 3.B., replicability has been used as a decisive factor in deciding whether certain mergers should be prohibited. As discussed, this is a limited view and does not accurately capture the competitive dynamics of markets with ecosystems. When considered at all levels (at the product market layer and at the ecosystem layer) and with the relevant factors (capabilities and complementarities), however, replicability can be a useful indicator of when a merger should be investigated.

In the *Booking/eTraveli* prohibition, the Commission held the position of the two parties was not replicable. Specifically, the Commission held that the position of eTraveli in the flight OTA market was difficult to replicate,[66] and that Booking's advantage in terms of content sourcing could not be replicated.[67] This was a decisive factor in the Commission's decision to prohibit the merger.[68] As discussed in section 3.B., this application of a 'replicability standard' does not capture the full extent of the competitive dynamic of markets with ecosystems due to

[65] Michael Kades and Fiona M. Scott Morton, 'Interoperability as a Competition Remedy for Digital Networks' (2021) available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3808372
[66] *Booking/eTraveli* (n 1), para 272
[67] *Booking/eTraveli* (n 1), para 465
[68] Guersent (n 6)

its emphasis on relevant markets. A **capability and complementarity replicability standard,** however, can be informative, though neither necessary nor decisive.

Such a standard can point out mergers that have a higher chance of having anti-competitive effects. Where the capabilities and/or the complementarities of the two merging parties are overlapping, replicability of these capabilities and complementarities could be indicative of the extent of the competitive constraint they exert on each other. Where these capabilities and complementarities are not replicable outside the merging ecosystem, there is a higher degree of softening of the horizontal competitive constraint from the merger. Similarly, when the merger involves two parties with overlapping capabilities and complementarities, the replicability of the capabilities and complementarities can indicate the extent to which entrenchment is likely to occur. When capabilities and complementarities cannot be replicated outside an ecosystem, the perceived barriers to entry and expansion for outsiders is higher, and entrenchment is therefore more likely.

It is necessary that this 'capability and complementarity replicability standard' consider the replicability of the capabilities and complementarities in both the product market and the ecosystem layer. Anti-competitive effects are most likely when they are not replicable in either layer, and least likely when they are replicable in both. These indicators are useful in setting enforcement priorities, and could be used to create a threshold for a safe harbour of sorts.

Though a valuable indicator, this standard is not neither sufficient, nor necessary. As explained in section 3.A., competition between ecosystem happens through substitutable complementarities. This means that there can be sufficient competitive constraints on a merged entity even when the specific capabilities and complementarities are not replicable. Similarly, even when the specific capabilities and complementarities are replicable, that may not lead to a sufficient competitive constraint on both the ecosystem level and the product market level. Therefore, though useful in the setting up of enforcement priorities and to create safe harbours,

the ‘capability and complementarity replicability standard’ should not be considered to be necessary nor sufficient for deciding the outcome of an investigation.

C. Ecosystem design

The methods in which consumers interact with the ecosystem, particularly in how they enter the ecosystem and how they use cross-platform tools, determines the extent to which entrenchment is possible. When consumers frequently multi-home, or compare outside an ecosystem before entering each individual component, user lock-in and thus entrenchment is less likely. When consumers do not multi-home, and their behaviour is strongly influenced by the design of the ecosystem, user lock-in and thus entrenchment is more likely.

The methods in which consumers interact with an ecosystem is not the same for all ecosystems. This is true of how consumers enter an ecosystem, and also how they move between component platforms of these ecosystems. Some ecosystems are typically entered through their core product (that governs the ecosystem), while others are typically entered from other components while the core product merely manages the network effects and complementarities. Similarly, consumers in some ecosystems move directly between different components of the ecosystem, often driven by the design of the ecosystem, while in others they ‘shop around’ before using different components. The more entry is within the core service, and the more that consumers are driven to stay within an ecosystem instead of ‘shopping around’, the higher the likelihood of user lock-in. Similarly, the lower the prevalence of multi-homing, the higher the likelihood of user lock-in.

Particularly indicative of this likelihood are practices that are designed to keep users within an ecosystem. Practices like nudging (or, particularly in digital ecosystems,

hypernudging)[69] and the use of dark patterns[70] mean that users are often discouraged from 'shopping around' through the use of design techniques. These practices are not inherently anti-competitive, though they can be used as tools for competition that deviates from competition on the merits. In ecosystem mergers, specifically, the prevalence of these practices can be an indicator that user lock-in and entrenchment is more likely. Additionally, conduct that imposes exclusivity on multi-homing consumers and mergers that reduce the ability or incentive of consumers to multi-home are more likely to lead to entrenchment.

Similar to the replicability standard described in section 5.B., this is merely an indicator of when an ecosystem merger might have a higher or lower chance of leading to entrenchment. The existence of these practices or changes to multi-homing should therefore be considered neither necessary nor sufficient.

D. Prevalence of third-party services

The way in which consumers interact with ecosystem is determined not only by the design of the ecosystems, but also by the presence of third-party services outside the ecosystem. Comparison services, in particular, can reduce user lock-in even when ecosystems are designed to prevent consumers from multi-homing or from shopping around.

Third party services available outside of an ecosystem often determine how consumers actually interact with the ecosystems. This is the case concerning both entering an ecosystem and in moving between the components of an ecosystem. Depending on these services, consumers might be able to balance the network effects and complementarities of an ecosystem with better offers from outside the ecosystem.

[69] See e.g. Viktorija Morozovaite, 'Hypernudging in the changing European regulatory landscape for digital markets' (2023) 15 Policy & Internet 78

[70] See e.g. Mark Leiser, 'Dark Patterns: the case for regulatory pluralism' (2020) available at: https://osf.io/preprints/lawarchive/ea5n2

Price comparison services, like Skyscanner, allow consumers shop around outside an ecosystem and therefore reduces the impact of ecosystem design, even once the consumer has entered an ecosystem. Alternative bundling services, like HumbleBundle, allow consumers to seek substitute complementarities from within and outside an ecosystem, or in combination of different ecosystems. Discount collection services, like Going, allow consumers to access deal from across ecosystem components and thus facilitating demand-side complementarities without user lock-in into an ecosystem.

In markets with ecosystems where the use of third-party services such as these is prevalent, then, a merger is less likely to lead to entrenchment. This is also true of markets with strong complementarities to markets where the use of these services is prevalent, since an ecosystem will not be able to entrench its dominant position based on those complementarities.

Similar to replicability and ecosystem design, the prevalence of third-party services is merely an indicator of the risk of entrenchment. This is also a highly contextual indicator, since the impact of the third-party service depends on factors such as its use, the relationship it has to different ecosystem components, and share of users who use them as their primary entry into an ecosystem. These factors are not static, and change as the ecosystems and markets evolve. The absence of third-party services should therefore be considered neither necessary nor sufficient.

E. Collective benefit and narrow harm

In *Booking/eTraveli*, the Commission focussed primarily on harm to hotels,[71] and dismisses efficiencies to flight operators and flight customers because these efficiencies are considered to be out of market.[72] They also argue these efficiencies are in any case not large enough,[73] but

[71] *Booking/eTraveli* (n 1), para 743
[72] *Booking/eTraveli* (n 1), para 1151-1152
[73] *Booking/eTraveli* (n 1), para 1171

this leaves open the conceptual question: what if efficiencies in one part of the ecosystem are actually higher than the harms in another part? Should the merger still be blocked on grounds that there is not full-compensation of those users that are harmed?

I suggest that consideration of ecosystem mergers should allow for in market and out of market benefits, by analogy to the concept of collective benefits treatment of sustainability agreements under Article 101.[74] The assessment would then be a trade-off between harms within the market and weighted out of market benefits. Further, defining the relevant markets for the purposes of this assessment as product markets does not capture the competitive dynamics of digital markets with ecosystems. Instead, relevant markets must be defined at the product market layer and at the ecosystem layer in order to conduct this assessment. Finally, even within a defined relevant market, there is often a trade-off between users that benefit from the merger, and users that do not.

I suggest that, even when the harms and benefits occur in different relevant markets, the benefits must still be taken into account. I draw an analogy here to the treatment of sustainability agreements under Article 101. Though these trade-offs are typically made within a relevant market, efficiencies generated on separate markets 'can be taken into account, provided that the group of consumers that is affected by the restriction and that benefits from the efficiencies is substantially the same.'[75] Essentially, this means that where there is a substantial overlap between the consumers suffering the harm in the relevant market and the beneficiaries of the efficiencies, the efficiencies should be taken into account if they are 'significant enough' to compensate for the harm.[76] Further, ecosystems should be allowed to show that these benefits should be taken into account by: (i) describing clearly the claimed benefits and providing evidence that they have already occurred or are likely to occur; (ii)

[74] Guidelines on the applicability of Article 101 (n 43), paras 582-589
[75] Guidelines on the applicability of Article 101 (n 43), para 583
[76] Guidelines on the applicability of Article 101 (n 43), para 584

defining clearly the beneficiaries; (iii) demonstrating that the consumers in the relevant market substantially overlap with the beneficiaries or form part of them; and (iv) demonstrating that the benefits outweigh the harms.[77]

A challenge for this assessment is the definition of the right relevant market in the first place. In *Booking/eTraveli*, the Commission defined two different relevant markets at the product market layer: (i) hotel OTA market; and (ii) flight OTA market. The Commission did not provide a market definition at the ecosystem layer. In markets involving an ecosystem, the market must be defined in both layers in order to capture the demand-side complementarities, as well as the potential efficiencies being generated. Defining an ecosystem layer market would better allow for in market and out of market harms and efficiencies to be examined and balanced.

Finally, a merger can have different effects within the same relevant market. Some consumers might benefit from a merger, while others face harm. This is particularly true of digital markets, where there are often multi-sided platforms serving different sides, or user groups. A merger might benefit some groups while harming others. In markets with ecosystems, it is possible that a merger will have different effects within the same group, since users within a group tend to have different ways of interacting with an ecosystem. For example, users within the same group may or may not multi-home, which would lead to different effects from a merger that reduces the ability to multi-home.[78] This trade-off must be taken into account in the assessment.

[77] Guidelines on the applicability of Article 101 (n 43), para 587
[78] See e.g., Paul Belleflamme and Martin Peitz, 'Platform competition: Who benefits from multihoming?' (2019) 64 International Journal of Industrial Organization 1, on how imposition of exclusivity can have different effects.

6. Conclusions

In this thesis, I define ecosystems as **a group of (possibly independent) actors or components, with a governance system jointly managing network effects, scope economies, scale economies, or learning effects, in a way that includes strong complementarities between the actors or components.** Further, I argue that markets with ecosystems have unique competitive dynamics. These dynamics mean that the assessment of mergers in these markets requires tailored theories of harm to capture potential anti-competitive effects. To this end, I propose two theories of harm tailored to markets with ecosystems.

First, I adapt the unilateral effects theory of harm from horizontal mergers to markets with ecosystems. I suggest that competition on markets with ecosystems occurs in two layers: in the product market layer between substitute products, and in the ecosystem layer between **substitute complementarities**. A merger involving an ecosystem can lead to unilateral anti-competitive effect based on softening of competitive constraints not only at the product market layer, but also at the ecosystem layer. This means that a merger might lead to more or less anti-competitive effects than forecasted by analysing only the product market layer.

Second, I adapt the entrenchment theory of harm to markets with ecosystems. Entrenchment does not depend on the conduct of the merged entity, but on potentially anti-competitive changes to the structure of the market, at either product market level or ecosystem level. This implies that the existing assessment framework for vertical and conglomerate mergers, the ability-incentive-effects framework, is unable to capture these changes because of its emphasis on relevant markets and the conduct of the merged entity. I propose an alternative assessment framework that focusses on consumer behaviour and contestability. I discuss the trade-off between, on the one hand, short run (efficiencies and increased consumer convenience) and medium run (increased access to innovation) benefits of a merger, and, on the other hand, short run (softening of competitive constraints), medium run (anti-competitive

changes to market structure), and long run (lack of entry and foreclosure of rivals) harms to competition. I also discuss the relevance of placing an inherent value on maintaining the contestability of markets with ecosystems.

I discuss potential limiting principles that could be placed on these theories of harm in order to ensure that they remain workable in practice. I discuss how a definitive assessment is challenging for ecosystem mergers, and how this might mean that it is beneficial to enforce remedies based on general principles of openness, such as interoperability, open standards, and data exchanges. Factors like a **capability and complementarity replicability standard**, existence of 'dark patterns' in ecosystem design, and a lack of third-party services like price comparison services or alternative bundling services can increase the likelihood that a merger involving ecosystems would lead to anti-competitive effects, though these factors are neither necessary nor sufficient. Finally, the assessment must account for both in market and out of market benefits as counter weight to the harms. The requirements for these out of market benefits can be drawn from the treatment of collective benefits from sustainability agreements under Article 101. For this, the market must be defined in both the product layer and the ecosystem layer. The assessment must also account for trade-offs between consumers who benefit and consumers who are harmed within a single market from different sides, or even consumers within the same side that behave differently.

The definition of ecosystems, the theories of harm, and the limiting principles described in this thesis could contribute to formalising and streamlining the attempts by the European Commission to apply merger control to ecosystems. This streamlining would not only offer legal certainty to parties, but would also clarify the procedure for investigation and rebuttal. This would also allow for these theories to be used in cases where there is an ecosystem element alongside other more classical theories of harm, such as in the *Amazon/iRobot* case.

It could also lead to different conclusions in cases like *Booking/eTraveli*. The Commission did not consider whether there was overlap in the capabilities of Booking and eTraveli, and whether they then exerted a horizontal competitive constraint on each other in the ecosystem layer, the Commission did not consider whether there were constraints on the merged entity on the ecosystem layer, and the Commission did not use an assessment framework that considered structural effects and contestability. Given the response to the decision, both from outside and within the Commission, assessments of ecosystem mergers could clearly benefit from a formalised and streamlined investigative approach.