Digital Platforms and Market Dominance: Insights from a Systematic Literature Review and Avenues for Future Research

Completed Research Paper

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Abstract

Companies that take advantage of digital platforms have rapidly gained a dominant position in their respective markets. While research on digital platforms yielded new insights into winner-take-all markets, envelopment, openness, or governance, no study provided a framework that integrates those aspects and links them to market dominance. We, therefore, conduct a literature review to assess how platform owners attain market dominance. We integrated our findings into a framework that depicts the interrelations between environmental factors and firm-level strategies as well as firm-level strategies and their effects for market dominance. The framework conceptualizes platform dominance to help a) attain it from a platform owner perspective, b) cope with it from a competitive perspective, and c) regulate it from a policy perspective. We propose three avenues for future research: (1) the role of national factors in attaining dominance; (2) factors enabling platforms to sustain dominance; and (3) strategies to dethrone dominant platforms.

Keywords: market dominance, digital platform, platform strategies, platform leadership, platform dominance

Introduction

In recent years, companies with digital platform-based business models have increased substantially in number and size (Evans and Gawer 2016), disrupting how people interact (e.g., Facebook), search for information (e.g., Google), and utilize services (e.g., Uber). Digital platforms are also transforming how companies create and capture value (de Reuver et al. 2018). Consequently, companies are forced to re-evaluate established business models, strategies, and organizational structures (Clemons et al. 2019; Hein et al. 2019a; Schreieck et al. 2019). Despite the increasing significance of platform-based business models, we lack a clear understanding of the interplay of platform strategies and ecosystem conditions, for example, the interaction of architectural openness, entry timing, and governance of platforms

(Suarez 2004; Tiwana et al. 2010). Although frameworks that address the management of evolving platforms and battle for technology dominance exist (Suarez 2004; Tiwana et al. 2010; van de Kaa et al. 2011), a more comprehensive understanding of interrelations between the *environmental factors* in platform ecosystems and *firm-level strategies* and their *effects for market dominance* is lacking. Whereas global market dominance of platform leaders has been documented (e.g. Gawer and Cusumano 2002), these studies focus solely on economic models and case studies. To the best of our knowledge, no framework exists that exhaustively integrates findings on platform dominance. However, this is particularly important to companies with linear value chains who are becoming dependent upon digital platforms, and consequently increasingly vulnerable and, therefore, must adopt new coping strategies (Hein et al. 2019a). Automotive manufacturers, for example, are increasingly depend on platforms like Android or Alexa to interact with customers, risking to be marginalized to a hardware provider. In this context, platform strategies become essential, either to become or to defend against platforms (Parker et al. 2016). Should competing companies prioritize flexibility by collaborating with dominant platforms, or build their own systems to avoid lock-in effects?

Furthermore, policymakers must understand how platforms attain market dominance to provide new policies to better regulate abuse of dominance, such as Google's illegal bundling of Google Search and Chrome with Android (European Commission 2018) or Amazon's self-preferencing of own products in its market place (European Commission 2019). Our objective is, therefore, to synthesize previous research and develop an integrated framework of *how digital platform owners attain market dominance.* The relevance of the framework lies in better understanding platform dominance to a) attain it from a platform owner perspective, b) cope with it from the perspective of a linear value chain company perspective, and c) regulate it from a legal and policy perspective.

We conducted a structured literature review (Webster and Watson 2002) to synthesize the interrelations between environmental factors in platform ecosystems and firm-level strategies and their effects for market dominance. We propose a conceptual framework for market dominance in platform ecosystems that will serve as a basis for future research. The research agenda comprises: (1) the role of national factors in attaining market dominance; (2) exploring factors enabling digital platforms to sustain and extend market dominance; and (3) strategies for new entrants to dethrone dominant platforms.

Theoretical Background

Market Dominance

Market dominance refers to Article 102 of the Treaty on the Functioning of the European Union. It characterizes a firm that enjoys such an economic strength that it can prevent effective competition in a relevant market by holding power to behave independently from competitors and consumers and by maintaining the possibility to abuse its power. By definition, abuse of power can increase prices above the competitive level, restrict output, and reduce consumer and social welfare (Evans and Schmalensee 2013). The existence of market dominance—usually measured as market share or firm survival—stems from a combination of various factors which, taken separately, are not necessarily decisive (Den Hartigh et al. 2016). Previous research has identified technological, strategic, and network-related factors, as well as the overarching perspective of evolution as critical aspects for gaining and sustaining market dominance (Den Hartigh et al. 2016; Suarez 2004; van de Kaa et al. 2011). *Technological factors* refer to innovativeness and technical architecture comprising modularity, compatibility, and flexibility (Den Hartigh et al. 2016). Cenamor et al. (2013, for example, demonstrate that compatibility positively influences market dominance. *Strategic factors* comprise entry timing, pricing strategy, type of licensing strategy, and marketing form and intensity (Suarez 2004). However, no single factor causes market dominance, rather they interaction, and each factor is usually accompanied by certain trade-offs and opportunity costs. For example, early market entry creates a larger installed base and reputation effects (Carpenter and Nakamoto 1990) but also locks the company into a specific technological trajectory (Dosi 1982) that might not reflect the dominant industry design in the future. *Network-related factors* encompass network size, network diversity, and network structure (Den Hartigh et al. 2016). Network size, for example, refers to the number of actors within the platform ecosystem and indicates the presence or absence of direct and indirect network effects (Eisenmann et al. 2006). Gallagher (2012,

for example, demonstrates that both types of network effects were positively associated with Sony winning the standard battle between Blu-ray and HD-DVD. The *evolutionary perspective* posits that the survival of a company results from natural selection (Arthur 1989; van de Kaa et al. 2011). The core tenet is that technological discontinuities emerge during the industry life cycle, introducing uncertainty and radical change (Tushman and Anderson 1986). Consequently, new paradigms emerge (Dosi 1993), causing new markets and services to emerge (Bower and Christensen 1995) in which companies can gain a dominant position.

Digital Platforms

Whereas linear value chains companies refer to companies that employ a step-by-step arrangement to produce, distribute, and sale a product (Parker et al. 2016), digital platforms transformed this arrangement and leverage the networked relationship of consumers, producers, prosumers (Hermes et al. 2020c) and the platform itself (Hein et al. 2020). Research on digital platforms encompasses four different perspectives. First, the *market perspective*, dating to Rochet and Tirole (2003), who studied the market power of platforms in the presence of external network effects. Such platforms facilitate transactions and match participants, and are referred by Evans (2012 as exchange platforms that "create value by helping two or more different types of users, who could benefit from getting together, find and interact with each other, and exchange value." Second, from a *technical point of view*, digital platforms are seen as software platforms that comprise modular services (Tiwana et al. 2010). Each modular service is a software subsystem capable of extending the functionality of the platform (Baldwin and Woodard 2009). Third, the *socio-technical perspective* investigates how digital platform owners integrate and manage their ecosystem (de Reuver et al. 2018). These innovation platforms offer technological building blocks such as APIs to orchestrate industry innovation by co-creating value with external complementors (Hermes et al. 2019; Schreieck et al. 2016). Fourth, from an *ecosystem perspective* (Riasanow et al. 2020), digital platforms rely heavily on autonomous agents that contribute to the value proposition of the digital platform (Teece 2018). Digital platforms thereby provide digital affordances to leverage the generativity of the ecosystem (Hein et al. 2019b). This basic principle underlines the need for digital platforms to provide and coordinate the autonomous agents while coping with the resulting independencies (Adner 2017; Kapoor 2018). We take all perspectives into account.

Methodology

We conducted a literature review following Webster and Watson (2002) concerning the establishment of platform dominance. Our study covers the intersection of two domains: digital platforms and market dominance. The literature search includes articles from the databases: Web of Science, Scopus, Business Source Complete, and IEEE Explore Digital Library. The search string across all databases included the following keywords: ("platforms" OR two-sided market* OR multi-sided market* OR multisided market*) AND ("market power" OR "dominance" OR "monopoly"). After an initial exploratory review, the search string was refined to include platform-specific concepts and strategies: "network effects" OR entry strateg* OR pric* OR "bundling" OR "openness" OR "envelopment." Figure 1 illustrates the scanning and selection process.

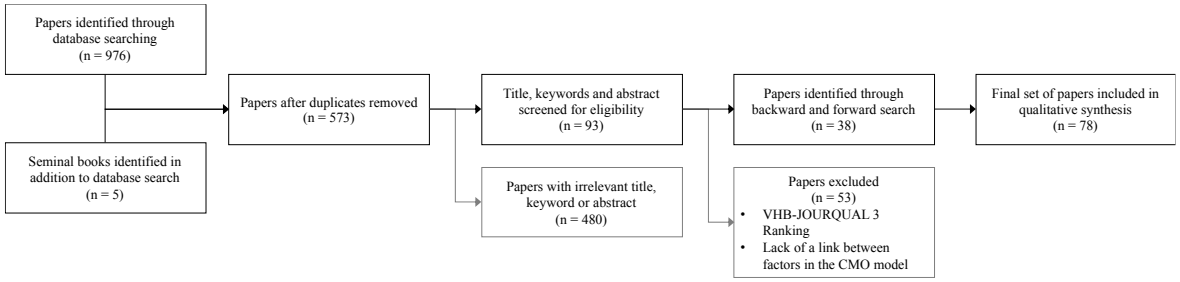

Figure 1: Flowchart Literature Search String

Following the coding process of the Grounded Theory approach, we adhere to the *"open*," *"axial,"* and *"selective"* coding procedure to synthesize the results of the literature review (Glaser and Strauss 1967; Wolfswinkel et al. 2013). Figure 2 depicts an example of the coding schema.

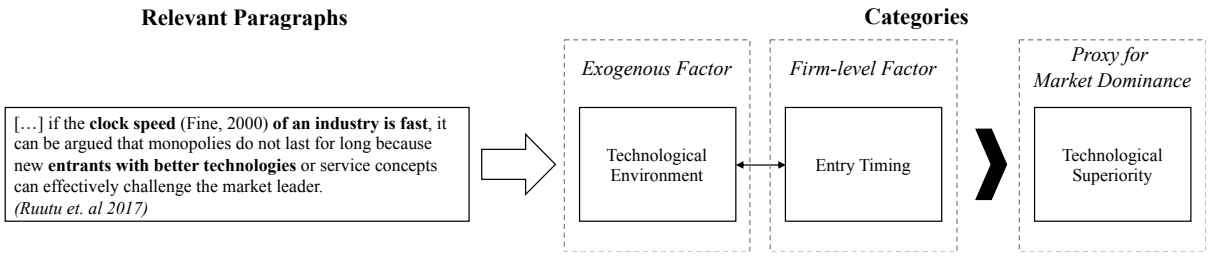

Figure 2: Example of the Literature Coding Schema

Towards a Conceptual Framework

Since our goal is not only to investigate the effects of firm-level strategies for market dominance but also to gain deeper insights about the interrelations between firm-level strategies and environmental factors, we built on the context-mechanism-outcomes (CMO) configuration model (Hermes et al. 2019; Linsley et al. 2015). According to Linsley et al. (2015), a CMO model is concerned "with understanding causal mechanisms (M) and the conditions (C) under which they are activated to produce specific outcomes (O)." Within our conceptual framework, context refers to environmental factors in platform ecosystems. Mechanisms cover firm-level strategies in a given context, while outcome reflects the effects for market dominance produced by mechanisms (see Figure 3). The Appendix provides an overview of the relationships identified in the literature.

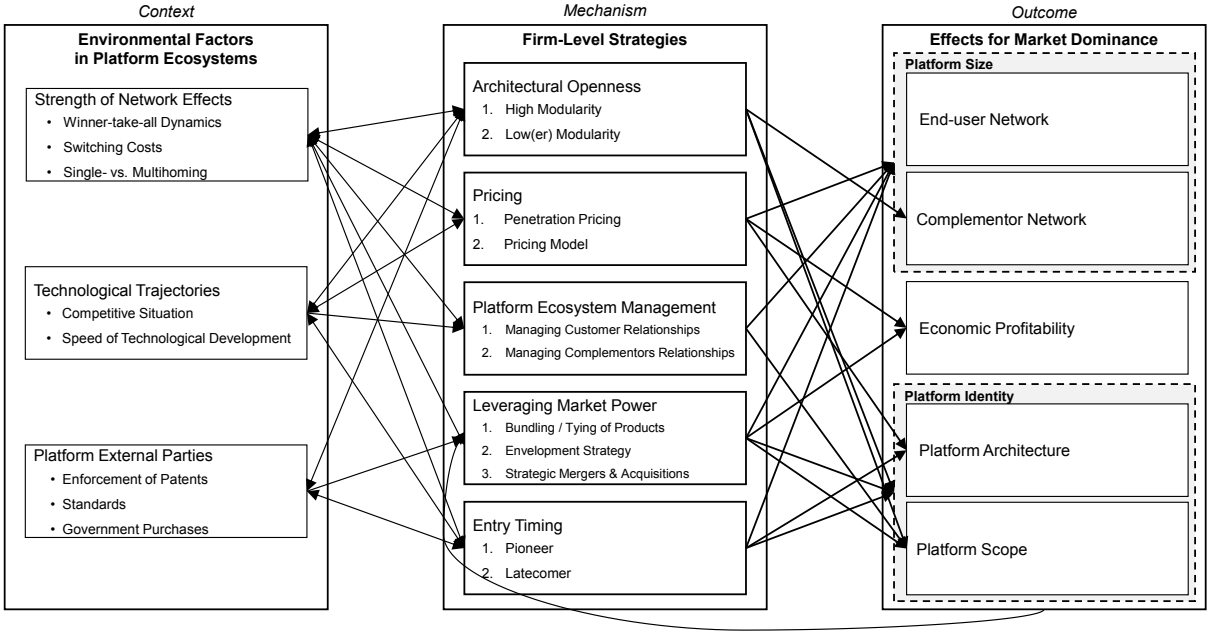

Figure 3: Framework for Digital Platforms and Market Dominance

Platform Environmental Factors and Firm-Level Strategies

Network Effects. When evaluating and developing strategies in multi-sided markets, platform owners must determine the prevailing network effects in the respective market and consider how to exploit them (Zhu and Iansiti 2019). Here, it is crucial to differentiate between direct network effects (within-group network effects) and indirect network effects (cross-group network effects) (Eisenmann et al. 2006). Although often abstracted away in literature, network effects can also be negative (Belleflamme and Peitz 2019). Network effects are impacted by the degree of multi-homing tendencies. These homing tendencies depend on the costs of adaption, operation, and other expenses incurred by platform affiliation, also known as switching costs (Armstrong 2006). Low homing costs imply that the systems are easy to use and adopt, and consequently, users will often multi-home increasing network effects. Thus, the higher the *Architectural Openness* of a platform, and the more support provided to developers,

the lower the multi-homing costs (Staykova and Damsgaard 2015). Homing costs can differ for different sides of a platform; while one group may be single homing, another group may be multi-homing. This is particularly relevant for *Pricing Strategies* that exploit platform dependencies of different market sides (Caillaud and Jullien 2003). Finally, network effects are also impacted by the degree of fragmentation of the network into local clusters. The more isolated each cluster is, the lower the strength of the network effects on a global scale, and hence, businesses in these networks are easier to challenge (Zhu and Iansiti 2019). The *Leveraging Market Power* mechanism suggests that if network effects are strong and positive, and multi-homing costs are high combined with low differentiation requirements of platform users, then there is a tendency for a winner-take-all (WTA) market (Den Hartigh et al. 2016; Eisenmann et al. 2006; Ruutu et al. 2017). Nevertheless, negative within-group effects may allow competing platforms to coexist (Belleflamme and Peitz 2019).

Technological Trajectories. Tiwana et al. (2010 describe technological trajectories as "the rapidity, unevenness, scope, and unpredictability with which complementary and substitutive technologies are emerging." Consequently, these competing technologies impact the evolution of a platform's ecosystem and the future development of modules (Tiwana et al. 2010). When multiple alternative technologies compete for dominance, this will impact the *Platform Ecosystem Management*. The level of complexity to reach an agreement with ecosystem actors such as complementors or customers depends on the number of actors in the same technological field, and the industry level of cooperation/competition (Suarez 2004). This means that more technological trajectories imply that a firm must devote greater effort and means to manage customer and complementors relationships which affects their incentives to pursue more or less aggressive competitive measures such as *Pricing Strategies* (Cennamo 2019). For *Entry Timing*, the speed of development in the technological environment is crucial. If the technological development cycles in the respective industry are fast, this implies that new entrants with superior quality or better service concepts are more likely to successfully challenge the market leader; hence, decreasing the duration of WTA situations (Ruutu et al. 2017).

Platform External Parties. Concerning *Architectural Openness* decisions, an important environmental factor is the appropriability regime established by the government. This allows firms to capture the benefits associated with innovation; it is determined by the efficacy of legal mechanisms, e.g., the enforcement of patents (Suarez 2004; Teece 1986). A tight appropriability regime makes it relatively easy to protect a firm's technology, while the opposite holds for a weak appropriability regime (Teece 1986). Additionally, the degree of openness might also be impacted by direct intervention by the government regarding the use of a certain technology. In some cases, regulators force platforms to be compatible among networks to enhance social welfare and to avoid the dominance of an inefficient technology standard. For instance, the European Union (EU) established a supranational and uniform standard among networks in the mobile communications industry (Fuentelsaz et al. 2015). For strategies based on *Leveraging Market Power*, the scope, content, and strictness of competition laws should be thoroughly assessed. Recent examples of companies failing to meet these laws are found in the files charged by the EU against Google for bundling their products in the Android operating system (European Commission 2018), and open investigations of Amazon for self-preferencing their products (European Commission 2019). Governments can also support the emergence of new technology, especially in the early stages, and, therefore, influence *Entry Timing* decisions. Government purchases may help a technology gain acceptance and hence make it more likely to become dominant in the market. At the same time, industry associations and standards organizations, e.g., the American Nation Standards Institute, can influence the evolution of a technology or a firm's timing of market entry (Suarez 2004). Finally, the power of service providers must be considered: Apple, for example, must consider AT&T's provision of network bandwidth in selling its iPhones (Tiwana et al. 2010).

Firm-level Strategies and Their Effects for Market Dominance

In the literature reviewed, most studies do not further specify the concept of market dominance in digital platform markets. To gain a more precise understanding of the effects of firm-level strategies for market dominance, we draw on the framework of Cennamo (2019), linking the dimensions of platform value to market dominance. Cennamo (2019) describes two main dimensions: (1) *Platform Size*, comprising the platform's *End-user Network* and the size of the *Complementor Network*, and (2) *Platform Identity,*

including *Platform Architecture*, referring to "the technological capabilities of a platform […]" and how its components interact with complements and *Platform Scope*, describing the distinctiveness of complements and the "different markets that the platform serves […]." We added the dimension of *Economic Profitability* to capture the economic rationale of platform owners. However, the effects for market dominance also result from the interaction of all dimensions.

Architectural Openness. We refer to architectural openness as (a) the access openness of a platform: the degree to which complementors can contribute to the platform; and (b) the resource openness: the rights associated with the use of open-source code (Karhu et al. 2018). The decision, whether a platform should be open or closed is usually not binary, but rather, a question of how much modularity a platform should offer, how open the interfaces should be, and to what extent information about the platform and interfaces should be disclosed (Cusumano and Gawer 2002). Especially, the level of modularity is a preponderant decision to be made concerning architectural openness.

Modularity refers to the technological architecture, which consists of building-block components that can be separated and combined according to the platform rules (Baldwin and Woodard 2009). Hence, this affects the development of the *Complementor Network* and the *Platform Scope* (Den Hartigh et al. 2016; Inoue 2019). In general, a managerial trade-off arises between: (1) a platform's high modularity that increases a complementor's incentive to innovate and allows to cope with *Technological Trajectories* such as new, technically superior platforms or increasing demand for open standards; and (2) low modularity that reduces competition and prevents platform imitation, also known as forking (Eisenmann et al. 2009). For instance, Apple maximized its returns from its proprietary resources by limiting platform openness and hence, avoided outbound spillover rents. In contrast, Google focused on maximizing relational returns from app complements by designing an open-source platform, but it also increased the risk of outbound spillover rents in form of forks (Karhu et al. 2018).

Successful platforms show that in principle, this rule applies: Protect the platform's core technology while at the same time use modular architecture and disclose information about interfaces to support and encourage the development of complementary goods. Eisenmann et al. (2009 argue that platforms must be able to lock-in customers to a certain degree and, therefore, excessive openness that decreases switching costs for users and increases competition might not be ideal. Apart from that, platform owners must decide about interoperability and backward-compatibility. Interoperability describes cross-platform transactions between users, achieved by adapters or gateways. Limiting interoperability between platforms can maintain or improve the *Platform Identity* and hence improve its value proposition. However, if user growth rates are decreasing, interoperability could eliminate incentives for users to multi-home, thus decreasing industry unit volumes. Decisions on backward-compatibility should be based on the industry's technological trajectories. If the clock of technological development is fast, platform owners should make their platform incompatible with next-generation platforms. The opposite applies if the rate of technological development is modest or slow (Eisenmann et al. 2009). Furthermore, architectural openness not only defines the platform's entrance and exit rules, but it also encompasses the provision of boundary resources, from APIs and SDKs to metadata (de Reuver et al. 2018; Hein et al. 2019c). A platform owner should assume the role of ecosystem curator by proactively offering boundary resources to increase and improve the *Platform Scope* and to promote the growth of the *Complementor Network* while reactively preventing competitive approaches to using these resources (Ghazawneh and Henfridsson 2013; Tiwana 2015).

Pricing. Researchers agree that pricing for platforms should follow a divide-and-conquer strategy, meaning that one side of the market is subsidized (divide) while the other side is priced at a premium to recover losses from the other side (conquer) (Caillaud and Jullien 2003; Rysman 2009). The objective here is to exploit cross-side network effects. Thus, determining which side of the platform should be subsidized and how much mark-up the other side is willing to pay to gain platform access is a critical success factor for a platform's revenue model (Eisenmann et al. 2006). Overall, this means that as platforms compete for single-homing users, they pass on, to a large extent, the profits earned from the multi-homing side to the single-homing side by charging lower prices or even zero prices (Armstrong 2006). Even in the absence of profits on the premium side, platforms are often willing to set very low prices, i.e., predatory pricing. This pricing strategy results in considerable losses for a platform to scale quickly, undercut competitors, and, hence, build up market dominance by increasing the *Platform Size*.

Subsequently, once competitors are driven out of the market and the platform's installed base is sufficiently large, a platform can leverage this base by charging higher prices to the platform's premium side (Cennamo and Santalo 2013). Here**,** platforms can use transaction fees as a further mechanism to *Generate Profits* and avoid consumers' coordination failures. Additionally, transaction fees are a powerful instrument for platforms to gain market share and enable platforms to differentiate their *Platform Architecture*. While one platform offers a low registration fee combined with high transaction fees, another offers a high registration free combined with low transaction fees, i.e., mirror-pricing (Caillaud and Jullien 2003). Sometimes platforms even increase their access fees to further distinguish themselves from the competition, provided that it incorporates distinct technologies (Cennamo 2019). Belleflamme and Peitz (2019 argue that different membership fees allow a platform to create greater product variety and increase *Economic Profitability*.

Platform Ecosystem Management. Users tend to form their self-fulfilling expectations regarding which platform will ultimately dominate the market and accordingly, adapt to this platform, which makes it necessary to manage customer expectations. This can lead to a monopoly equilibria situation, where all consumers and developers adapt to one platform because they expect this platform to be dominant in the future (Zhu and Iansiti 2012). Accordingly, the expected size of the network determines the platform's success or failure rather than actual network size (Sun and Tse 2007). Platform owners should, therefore, have a strong interest in pursuing strategies that positively influence user expectations, thus growing the *End-user Network*. These strategies can be either quantitative, for example, the current size of the network and the respective market share, or qualitative, by focusing on brand value, reputation, strategic commitments, and pre-announcements (Den Hartigh et al. 2016; Fuentelsaz et al. 2015). In general, marketing strategies should be closely linked to pricing strategies because cross-network effects are decisive about which platform side should be addressed by marketing strategies (Eisenmann et al. 2006). Consequently, marketing efforts are influenced by the strength of network effects: the stronger and more positive the network effects, the more important and effective the marketing efforts (Eisenmann et al. 2006). Additionally, by effectively managing customer relationships, the network intensity can also be strategically manipulated by (a) increasing customer participation through product ratings (e.g., Amazon's review system fosters direct *Network Effects*) or (b) creating better opportunities for users to interact with other users (e.g., as in online gaming) (McIntyre and Chintakananda 2014).

Besides managing customer relationships, platforms need to cope with complementor relationships. This dimension concerns the allocation of the platform- and app-based decision rights between the platform owner and the developer community and the design of incentive structures. Concerning decision rights, management must find a way to adequately bind complementors without excessively constraining the level of innovation. As the Nintendo Wii demonstrated, even a technologically superior platform ecosystem cannot sustain in the long run without the development of innovative and high-quality complements (Inoue 2019). To avoid this, management must first assess how dependent the platform is on complementors to conceptualize its strategic maneuvering. This means knowing to what extent complementary products are developed internally versus by external developers.

Management must also decide on the level of competition established among their complementors, which can be orchestrated through the platform's licensing policy (Gawer and Cusumano 2002). A liberal licensing policy is associated with a higher level of competition and often results in a partial loss of control over the platform's technological development (Suarez 2004). Boudreau (2012 also shows that, while on the one hand, adding more complementors to a platform increases the *Complementor Network* and hence, leads to increased attraction for end-users due to positive cross-*Network Effects*. On the other hand, more complementors will reduce the incentives for other complementors, due to the negative within-group network effects, resulting in crowding-out of complementors. This implies that if strong negative indirect network effects are present, management should consider granting exclusive rights to certain complementors and ensure that it does not exploit its monopoly market power on the other side of the market (Eisenmann et al. 2006). Another aspect of the management of complementors is that it allows a platform to increase and differentiate its *Platform Scope* by choosing how a portfolio of complementary products differs vis-a-vis competitors. Encouraging and supporting complementors in a certain niche market (e.g., small app category) or controlling the quality of complements

(Constantinides et al., 2018) allows a distinctive positioning of the platform and hence, increases its market dominance (Cennamo and Santalo 2013).

Leveraging Market Power. Tying occurs when one good is sold (tying good) under the obligation of buying another good (tied good). Bundling strategies are differentiated into pure and mixed bundling. Pure bundling occurs when two goods are only sold as a package, and it is impossible to buy them separately. In contrast, mixed bundled goods can be purchased either individually or as a package. Because digital markets are particularly vulnerable to leveraging practices, where shared user relationships (demand-side economies of scope) and common components (supply-side economies of scope) are exerted, they are also especially prone to tying and bundling practices (Gawer 2014). A popular tying example is Google that ties additional services to search results and places them in highlighted positions. Furthermore, Google grants these services free traffic and hence, reduces start hurdles (Edelman 2015). Moreover, by reducing heterogeneity in the consumers' aggregated valuation of a package, bundling enables a platform to gain a higher share of surplus than selling goods separately (Eisenmann et al. 2009). A famous example is Microsoft bundling its operating system with a media player and browser (Amelio and Jullien 2012).

Platform envelopment is defined as the "entry by one platform provider into another's market by bundling its own platform's functionality with that of the target's so as to leverage shared user relationships and common components" (Eisenmann et al. 2011). Key success factors for envelopment are either: (a) that the user base of the attacker and the target market overlap significantly; (b) that the enveloper can achieve price discrimination advantages; or (c) economies of scope are high in the targeted market (Eisenmann et al. 2011). Three different types of platform envelopment strategies must be differentiated. First, the envelopment of complementary platforms, where a high overlap of the user base is an important prerequisite for success. A special case in this context concerns platforms that are enveloping into their own third-party developer markets. The example of Google's unanticipated expansion into the photography app market shows that due to the greater attention, innovation in these markets can be fostered in the form of enhancing the *Platform Scope* (Constantinides et al. 2018; Foerderer et al. 2018). Additionally, this tactic allows platforms to generate higher revenues (*Economic Profitability*) by imitating successful complementary products, e.g., Amazon providing high-rated products on its own (Hermes et al. 2020b), or to improve the *Platform Identity* by enveloping into complementary markets that offer low-quality complements (Wan et al. 2017). Second, envelopment of substitute platforms wherein high economies of scope have to be achieved to offer deep discounts in the targeted market. Finally, the envelopment of platforms with unrelated functions which leverages common components and the user base to unify "in a single device the functions performed by previously distinct products" (Eisenmann et al. 2011).

Over the last decade, the largest platforms have engaged in numerous mergers and acquisitions (M&As): Apple acquired Shazam, Facebook acquired WhatsApp, and Google acquired Doubleclick. Often, dominant platforms acquire start-ups with fast-growing user bases, intending to eliminate potential future competitors. Since targets usually had relatively low turnover and competition authorities do not consider data or user bases for M&A reviewers, dominant platforms could easily extend their scope and competitive advantage. Alongside these competitive benefits, platforms also try to increase user loyalty by offering new services from the acquired companies (Crémer et al. 2019). For example, Cisco builds very little of its end-user applications; rather, it acquires applications when it wants to expand its product offering capabilities. Hence, M&A is a powerful method to influence *Platform Size* and *Platform Scope* (Gawer and Cusumano 2002).

Timing of Market Entry. Early mover advantages can be achieved by quickly scaling the business in the absence of competitors and allows the platform to build an early installed base. This helps to create reputational effects and hence, positively influence customers' expectations. Here, the advantage of an early installed base is further strengthened by the herding effect of online users, because later users tend to follow the choices made by previous users. Moreover, an early market entry allows a firm to secure access rights to specific key resources, e.g., protect innovations with patents, gain technological expertise, and exploit behavioral demand-side factors by shaping customer preferences (Suarez 2004; Wang et al. 2016). These factors help early movers to increase switching costs, lock-in existing customers, establish *Network Effects*, and deter potential rivals from entering the market (Bamberger

and Lobel 2017). Furthermore, launching a platform faster than rivals can differentiate a firm from its competitors in terms of *Platform Identity* and *Platform Size* (Staykova and Damsgaard 2015). Successful examples for early movers are eBay and YouTube, which were able to defend their leading market positions against late entrants such as the Yahoo auction site or Google Video (Zhu and Iansiti 2012).

Being an early mover, however, involves several risks and disadvantages that lead to four main reasons why platform owners might choose to postpone their market entry. First, early movers are often forced to alter their existing business models, as they face a greater uncertainty regarding their users' needs, and might lock into a particular technology that later proves to be obsolete (Eisenmann 2006; Suarez 2004). Second, a pioneer must educate the market about the new product. Consequently, considerable marketing spending compared to non-pioneers is necessary to build the requisite market awareness (Den Hartigh et al. 2016; Eisenmann 2006). Third, a late entrant can incorporate the latest technology on its platform and beat the incumbent on costs by reverse-engineering its products and entering the market with a superior *Platform Architecture* (Eisenmann et al. 2006)**.** Finally, once an early mover faces increased competition, they are less likely to pursue accelerated growth strategies due to less flexible organizational structures and already gained market shares. Summing up, early movers pave the way for others by reducing the amount of uncertainty and by creating the required market awareness. Therefore, while the pioneer bears all the risks and costs, latecomers can free-ride (McIntyre and Srinivasan 2017; Rothe et al. 2018). Google, for instance, entered the web-search market several years later but became so successful by replacing a cluttered portal with a simple and fast home page. Also, Google copied and optimized Overture's paid listing model for revenue generation from searches (Eisenmann et al. 2006).

Limitations and Future Research

Our research has several limitations. First, the chosen keywords for the literature search may be incomplete, thus not capturing all relevant studies. Second, to classify and compare all sample papers, a fixed coding schema was applied, which may risk excluding or simplifying certain aspects and insights covered in the present literature. Third, in the course of the model construction process, we regard platforms from a global perspective, not accounting for industry-specific factors and risks. Consequently, this research proposes overall strategic considerations, however, their application might vary from one industry to another. Moreover, the reviewed articles mainly investigated digital platforms from western and industrialized domains which limits the generalizability of our results since digital platforms from eastern or growing domains might employ different CMO configurations.

We propose three areas for future research: (1) the role of national factors in attaining market dominance; (2) exploring factors that enable digital platforms to sustain and extend their market dominance; and (3) strategies for new entrances to dethrone dominant platforms.

While prior work focuses on the interplay of environmental and firm-level factors for attaining market dominance, it neglects more general and historical aspects such as capital access, state interventions, or legacy systems. These aspects are, however, important to better understand the breeding grounds of digital platforms, and can help develop a theoretical framework to understand why American platforms largely dominate the EU in online consumer-facing markets and why China has mainly escaped American domination to establish a self-sufficient platform economy (Evans and Gawer 2016). A more comprehensive understanding of national discrepancies enables making important practical contributions such as deriving strategies for the EU to become a dominant driver of digital platforms. That is highly important if the EU wants to remain competitive and sovereign in the platform economy (Parker et al. 2016) and to regain control over new forms of critical platforms (e.g., Facebook in elections; Google in consumer access; and Amazon in cloud computing). While some initial work for American platform domination and China's self-sufficiency exists (Hermes et al. 2020a), we suggest conducting a comparative analysis of American and European platform equivalents. Comparing equivalent platforms between both continents, such as Facebook and StudiVZ, will provide a more nuanced understanding of the role of national factors.

The second avenue suggests that future research moves beyond the question of how digital platforms *attain* dominance, toward investigating how they *sustain and extend* dominance. This is particularly important to the regulatory perspective of digital platforms since long-term dominance poses a realistic threat of abuse of power compared to ephemeral dominance. On the one side, some factors, such as network effects, might account for both attaining and sustaining dominance, while other factors, such as platform envelopment (Eisenmann et al. 2011) or inappropriate M&A rules (e.g., Facebook acquiring WhatsApp without being thoroughly scrutinized), might only contribute to sustaining and extending dominance. The benefit of platform envelopment is that the platform harvests rents from superadditive value (Jacobides et al. 2018; Schreieck et al. 2019) and expands its architectural control across multiple industries (Cennamo 2019). Google, for example, controls the platform core (Android) and complementary apps (e.g., YouTube, GoogleMaps, Search), and thereby generates superadditive value. In other words, the value of Android plus YouTube plus Google Maps plus Search is greater than the sum of their values as standalone offerings (Clemons 2018). Moreover, the owner of the core can deliberately limit interoperability, thereby defending its complementary apps such as Google did with the Mobile Application Development Agreement (Edelman and Geradin 2016; European Commission 2018); hence, further restricting competing offers and further extending and sustaining dominance.

Particularly important will be the envelopment of new technological paradigms such as voice-based digital assistants and operating systems for smart devices. The current market development shows that giant American platform operators are going to control or even dominate these paradigms as well (think of Google Home, Siri, Alexa, and Cortana as well as Google's WearOS, Android Auto, and Android TV. In this context, we not only encourage investigating how giant platform operators have enveloped and, thereby, extended their dominance; we especially call to explore the implications of controlling such an ecosystem of platforms. Controlling both operating systems and digital assistants might critically impact (European) B2C businesses. While control over operating systems allows the platform owner to deliberately limit access and interoperability, digital assistants provide the platform owner with a highly important interface to capture consumer needs. Hence, controlling those two technologies might increase businesses' dependency on a small set of giant platform operators. As an example, an autonomous car manufactured by BMW will only be useful to consumers if Google shares the GPS location of the users and the place she would like to go as well as an initial request for the autonomous car that has been triggered through Google's voice assistant. Even if Google shares this information, it places BMW at a significantly vulnerable strategic dependence. That is because Google could decide to have an autonomous car by Audi pick up the user instead. Assuming that future consumers care less about the brand of their autonomous car, this places Google in a powerful position since Google could decide to forward all transportation requests to Audi instead of BMW, significantly reducing BMW's customer base.

Investigating how to counteract the situation described above represents the theme of the third avenue for future research: How can new entry dethrone existing platform leaders? We propose to theorize and empirically study two approaches. First, engaging in *industry consortia* to build alternative solutions (Hermes et al. 2020d). In contrast to single firms, consortia can leverage synergies between multiple, well-established partners. On the one hand, partners can merge financial and human resources to overcome, for example, the chicken-and-egg problem by leveraging their joint installed customer base. On the other hand, consortia of incumbents enjoy detailed know-how about markets and technologies and are, therefore, well-suited to building valuable alternatives. However, consortia have also significant downsides such as longer decision-making processes and conflicting interests, e.g., IP rights. Second, shifting toward decentralized decision-making such as in *platform cooperatives* (e.g., Stocksy, Partago, Fairmondo). Cooperatives, in general, refer to autonomous associations of persons united voluntarily to achieve their common economic and social goals through jointly-owned and democratically-controlled companies. Future research may extend knowledge in this domain to better understand the outcomes for consumer welfare and total welfare, the ability and willingness to abuse power and violate laws, and the possibility of granting actors of platform ecosystems decision rights in the future development of the platform. Hence, rejecting the idea of the sharing economy (abandoning ownership) and exploring the counterargument (ownership for all) might reveal novel insights into appropriate legal structure and regulation of digital platform leaders.

Conclusion

While research on digital platforms and market dominance has explored economic models, single and multiple case studies, to the best of our knowledge, no study synthesized the various findings into an integrated framework. Therefore, we conducted a systematic literature review to synthesize previous research and drew on CMO configurations to develop an integrated framework of *how digital platform owners attain market dominance.* Our study thereby contributes to theory by (1) explaining the interrelations between environmental factors in platform ecosystems and firm-level strategies as well as firm-level strategies and their effects for market dominance and (2) outlining three fruitful avenues for future research. In terms of practical contribution, our framework supports both, linear value chain companies and policymakers, to better understand how digital platform owners attain market dominance. While linear value chain companies can use this knowledge to develop appropriate coping strategies, policymakers can provide new policies to better regulate abuse of dominance.

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Appendix

Table 1: Overview over the interrelations identified in the literature

Links between Context (C) and Mechanisms (M)		Links between Mechanisms (M) and Outcome (O)	
Network Effects ↔ Architectural Openness	▪ Armstrong, 2006 ▪ Staykova & Damsgaard, 2015 ▪ Eisenmann et al., 2009	Architectural Openness → Complementor Network	▪ Den Hartigh et al., 2016 ▪ Evans & Gawer, 2016 ▪ Inoue, 2019
Network Effects ↔ Pricing	▪ Armstrong, 2006 ▪ Eisenmann et al., 2006	Architectural Openness → Platform Identity	▪ Eisenmann et al., 2009
Network Effects ↔ Platform Ecosystem Mgmt.	▪ Boudreau, 2012 ▪ Karhu et al., 2018 ▪ Inoue, 2019 ▪ McIntyre & Chintakananda, 2014	Architectural Openness → Platform Scope	▪ Ghazawneh & Henfridsson, 2013 ▪ Tiwana, 2015
Network Effects ↔ Leveraging Market Power	▪ Den Hartigh et al., 2016 ▪ Ruutu et al., 2017 ▪ Eisenmann et al., 2006	Pricing → Economic Profitability	▪ Eisenmann et al., 2006 ▪ Armstrong, 2006 ▪ Cennamo & Santalo, 2013
Network Effects ↔ Entry Timing	▪ Zhu & Iansiti, 2012	Pricing → Platform Architecture	▪ Caillaud & Jullien, 2003 ▪ Belleflamme and Peitz, 2019 ▪ Cennamo, 2019
Technol. Trajectories ↔ Architectural Openness	▪ Ruutu et al., 2017 ▪ Eisenmann et al., 2009	Pricing → Platform Size	▪ Bamberger & Lobel, 2017 ▪ Eisenmann et al., 2006 ▪ Cennamo & Santalo, 2013
Technol. Trajectories ↔ Pricing	▪ Rysman, 2009	Leveraging Market Power → Platform Scope	▪ Constantinides et al., 2018 ▪ Gawer & Cusumano, 2002
Technol. Trajectories ↔ Platform Ecosystem Mgmt.	▪ Cennamo, 2019 ▪ Suarez, 2004	Leveraging Market Power → Economic Profitability	▪ Wan et al., 2017
Technol. Trajectories ↔ Entry Timing	▪ Ruutu et al., 2017	Leveraging Market Power → Platform Size	▪ Eisenmann et al., 2011 ▪ Zhang and Duan (2012
Platform External Parties ↔ Architectural Openness	▪ Fuentelsaz et al., 2015 ▪ Suarez, 2004 ▪ Teece, 1986	Leveraging Market Power → Platform Identity	▪ Wan et al., 2017
Platform External Parties ↔ Leveraging Market Power	▪ Bamberger & Lobel, 2017	Platform Ecosystem Mgmt. → Platform Scope	▪ Constantinides et al., 2018 ▪ Boudreau (2012) ▪ Cennamo & Santalo, 2013 ▪ Tiwana et al., 2010 ▪ Wan et al., 2017 ▪ Inoue, 2019
Platform External Parties ↔ Entry Timing	▪ Suarez, 2004	Platform Ecosystem Mgmt. → Platform Size	▪ Den Hartigh et al., 2016 ▪ Fuentelsaz et al., 2015
		Entry Timing → Platform Architecture / Platform Identity	▪ Staykova & Damsgaard, 2015
		Entry Timing → Platform Size	▪ Eisenmann et al., 2006