

THE COEVOLUTION OF PLATFORM DOMINANCE AND GOVERNANCE
STRATEGIES: EFFECTS ON COMPLEMENTOR PERFORMANCE OUTCOMES

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Multi-sided platforms such as Apple's App Store and Valve's Steam become increasingly dominant when more end users and complement producers join their ecosystems. Despite their importance to a platform's overall success, however, we know little about complement producers and how they are affected by a platform's dominance trajectory: *How does a platform's increasingly dominant market position affect performance outcomes for complementors?* We explore this question by conducting a multiple case study on four market leading platform ecosystems over several years. We discover that, as a platform becomes increasingly dominant, the platform sponsor's governance strategies shift from being largely supportive of the wider complement population to becoming more selective and geared toward end users. These changes are associated with shifts in complementor performance outcomes. Though the value created at the overall ecosystem level increases as a platform gains dominance, average demand for individual complements decreases and becomes progressively concentrated. Furthermore, we find that prices for complements decline while the costs complementors incur increase. These findings are particularly salient in the context of *digital* platform ecosystems, where platform sponsors can seamlessly alter their technological infrastructures and implement changes to extend and solidify their dominant positions.

Keywords: *platform strategy, platform governance, network orchestration, complementors, technological dominance, digital transformation*

“Getting your game on Steam—if you could manage to somehow contact Valve and impress the company with your wares—was a golden ticket to sales and success. Those days are over [...] While selling a game on Steam has never been easier, only a “chosen few” are reportedly lucky enough to have Valve’s mysterious algorithm favor them with some promotional screen real estate.”—Tim Colwill (Polygon)²

Multi-sided platforms are organized around a stable—often digital—technological core that enables transactions and facilitates interactions between two or more distinct groups of users who are connected via an indirect network (Rochet and Tirole, 2003). Steam, Valve’s digital distribution platform, for example, connects game developers and end users by offering a curated marketplace for PC games. Though a multi-sided platform may initially have to fight hard to draw in users (Eisenmann, Parker and Van Alstyne, 2006), if it succeeds in attracting a critical mass it will ultimately enjoy a powerful market position paired with strong bargaining power over the users in its ecosystem (Bresnahan and Greenstein, 1999; Johns, 2006).

The antecedents and consequences of platform dominance are well-documented (e.g., McIntyre and Srinivasan, 2017).³ Early work in economics pointed to path dependencies as a key driver for success in markets characterized by increasing returns to adoption (Arthur, 1989; Katz and Shapiro, 1985), whereas more recent work in strategic management emphasized the importance of strategic agency on the part of the platform sponsor (Schilling, 1998; 2002; Suarez, 2004). Though the quality of the platform’s technological core is an important factor,

² <https://www.polygon.com/2018/10/19/17959138/steam-valve-developer-support-pricing-reviews> - Accessed: May, 2020.

³ The notion of platform dominance is rooted in the literature on dominant designs (Anderson and Tushman, 1990; Suarez and Utterback, 1996). Early definitions focused on the platform’s market share and required that a single platform competitor would emerge as the clear victor following a battle for dominance (e.g., Suarez, 2004). More recent definitions allow for the co-existence of multiple platforms competing in the same market, and define platform dominance based on the technological attributes that are widely accepted as best meeting users’ needs (e.g., Tiwana, 2013). The Apple iPhone is often mentioned as an exemplar of a dominant platform. Not only does Apple control a large share of the smartphone market, its design characteristics define industry norms for firms competing in the same market (Cusumano, Gawer and Yoffie, 2019; Tiwana, 2013).

two other factors can be equally—if not more—important for attaining dominance: The size of the installed base (i.e., the number of end users who have adopted the platform), and the availability of complements (e.g., video games or software applications that run on the platform). In many markets, the platform with the largest installed base and the highest number of complements can lock-out rival platforms and dissuade complementors and end users from switching to a competing platform (Farrell and Saloner, 1986; Schilling, 2003).

Despite their importance to a platform's success, we know little about complementors and how they are affected by a platform's dominance trajectory (Jacobides, Cennamo and Gawer, 2018). That is, *as a platform becomes increasingly dominant, how does this affect performance outcomes for individual complementors?* Producers of complements are likely affected by a platform's increasingly dominant position in myriad ways: First, growth of the platform's installed base increases the addressable audience of end users to which a complementor can sell (Venkatraman and Lee, 2004)—a positive effect. Second, such growth typically attracts additional entry from complementors, which can lead to competitive crowding (Boudreau, 2012; Boudreau and Jeppesen, 2015; Markovich and Moenius, 2009)—a negative effect. A third factor concerns the platform itself. As a platform gains dominance, the platform sponsor's bargaining power over complementors increases, which may affect how it orchestrates its ecosystem (Cusumano and Gawer, 2002; Iansiti and Levien, 2004; Yoffie and Kwak, 2006). This is illustrated by the opening quote, that points to how Valve changed Steam's entry criteria for game developers and updated the platform's promotional algorithms.

We study the coevolution of platform dominance and governance strategies and their impact on complementor performance outcomes by conducting a multiple case study on four platform ecosystems (Eisenhardt, 1989; Yin, 2017): Apple's iOS App Store (mobile apps), Kickstarter (crowdfunding), Kiva (microfinancing), and Valve's Steam (digital PC games). Not only are these platforms widely regarded as market leaders within their respective industries,

they also have a significant history, allowing us to retrace their dominance trajectories and track complementor performance outcomes over a period of multiple years. These commonalities aside, our cases exhibit important differences in their value appropriation orientation: Apple (public) and Valve (private) are fully focused on maximizing shareholder value, while Kickstarter (public benefit corporation) and Kiva (non-profit) also contribute to public welfare. We explore how these differences influence the ways a platform sponsor orchestrates its ecosystem and how this differentially affects performance outcomes for complementors.

Our analysis revealed that as a platform gains dominance, the platform sponsor adjusts its governance strategies by implementing three types of governance changes: First, *structural governance* changes entail updates to a platform's technological core and are aimed at introducing more effective or novel ways for complementors to create and capture value. Second, *boundary spanning governance* changes are aimed at increasing the depth and breadth of the complement pool by reducing the platform's entry barriers. Third, *redistributive governance* changes are aimed at facilitating and directing end users in their choice of complements. Moreover, the extent to which the platforms in our sample implemented these changes varied with the platform sponsor's for-profit versus public value orientation. That is, the implementation of governance changes was more pronounced when the platform sponsor had a stronger orientation toward creating value for shareholders rather than public welfare.

When we mapped platforms' evolving governance strategies onto complementors' performance outcomes we discovered three broad trends: First, while the value created at the overall ecosystem level increased, demand at the individual complement level decreased. Second, the discrepancy between complements enjoying superior market performance and those with lagging market performance widened, thus skewing the distribution of demand for complements. Third, we found that prices for complements declined, while the costs for acquiring users and other marketing related expenses increased. Taken together, these findings

suggest that it becomes harder for most complementors to capture value as a platform becomes increasingly dominant. We provide evidentiary support for the link between platform governance changes and complementors' performance outcomes by mapping longitudinal shifts in complementor performance onto specific governance changes (Raffaelli, 2018). We also triangulate our findings with illustrative quotes from our qualitative data sources.

Our findings contribute to three streams of research. First, we contribute to the research on platform governance. Given its central position in the ecosystem, a platform sponsor often is in a strong position to exert governance over its users (Adner and Kapoor, 2010; Boudreau and Hagiu, 2009; Wareham, Fox and Giner, 2014). Our study joins recent work by Huber, Kude and Dibbern (2017) and Kyprianou (2018) by showing that a platform sponsor's governance strategies change over time. We extend this research by documenting how the implementation of an evolving governance framework affects the overall creation and distribution of value in the ecosystem. Second, we contribute to literature on the orchestration of innovation networks. Innovation networks are often managed by a hub firm that is responsible for the network's collective innovation effort and the distribution of value among its members (Dhanaraj and Parkhe, 2006; Lorenzoni and Baden-Fuller, 1995; Nambisan and Sawhney, 2011). We add to recent work showing that the hub firm's strategic objectives influence how it orchestrates the network (Giudici, Reinmoeller and Ravasi, 2018). Specifically, we show that the amount and type of changes a hub firm implements are influenced by the hub firm's value appropriation orientation. Third, we contribute to the literature on platform complementors. Prior work demonstrated that a complementor's performance may be influenced by such factors as its fit with the platform's technological core (Tiwana, 2015, 2018) and the composition of the end user base (Rietveld and Eggers, 2018). Our work adds to this literature by highlighting the platform sponsor's active role in shaping value capture dynamics for complementors (Claussen, Kretschmer and Mayrhofer, 2013; Kapoor and Aggarwal, 2017; Rietveld, Schilling and

Bellavits, 2019). Specifically, we show that a platform's increasingly dominant position is not unequivocally associated with improved performance outcomes for complementors.

THEORETICAL BACKGROUND

To understand how complement producers are affected by a platform's dominance trajectory we have to acknowledge their interdependent position in the ecosystem. A consumer's decision to adopt a complement is dependent on his or her adoption of the platform itself (Bayus, 1987; Rogers, 2010). Similar to blades and razors or DVD players and DVDs, complements constitute goods or services that are intended for conjoint use with a platform (Peterson and Mahajan, 1978). Apps developed for the iOS App Store, for example, can only be used by consumers who also own an iPhone or iPad. Without having adopted the platform, a consumer derives no value from a complement. This implies that we cannot study the effects of a platform's market position on complementors without also looking at some of the other dimensions that co-vary with the platform's dominance trajectory. Prior literature identified three broad factors that are relevant in this regard: demand side factors, supply side factors, and platform level factors.

Demand Side Factors Affecting Complement Performance

First, a complementor's performance is intuitively linked with the size of the platform's installed base. Other things being equal, a platform with many end users offers a large potential pool of customers to which complementors can sell (Boudreau and Jeppesen, 2015; Rietveld and Eggers, 2018). Recently, however, nuance was added to these installed base arguments by research showing that end users are heterogeneous and that such heterogeneity affects the performance of complements. Applying Rogers' (2010) innovation adoption theory in the context of console video games, Rietveld and Eggers (2018) showed that late platform adopters generally have a lower willingness-to-pay, are more risk averse, and seek less novelty than

early platform adopters. The authors argued and found that innovative video games that are released later in the platform life cycle (when there are relatively more late adopters) perform worse despite the larger pool of potential customers (also see: Gupta, Jain and Sawhney, 1999).

Supply Side Factors Affecting Complement Performance

Second, research has highlighted the potential congestion effects of complements joining a platform. Growth of a platform's installed base typically attracts additional entry by complementors. This can lead to competitive crowding when the entry rate by complementors outweighs the platform adoption rate by end users (Clements and Ohashi, 2005; Markovich and Moenius, 2009). Such over entry can negatively affect complementors' performance—particularly when many complementors are entering the same product category, vying for the same customers (Boudreau, 2012). Analyzing software applications for Personal Digital Assistants (PDAs), Boudreau (2012) found that although additional entry enhances the cumulative variety of software available for the PDA ecosystem, it negatively affects individual developer variety, especially in those software categories where entry rates are the highest.

The net effect of positive demand externalities and negative same side externalities is anything but straightforward; it can lead to either positive or negative performance outcomes for complementors. Among others, this depends on the specifics of the platform (Parker and Van Alstyne, 2005), the relative strength of both types of externalities (Boudreau and Jeppesen, 2015), and the type of competition complementors face (Eckhardt, 2016).

Platform Level Factors Affecting Complement Performance

Third, research increasingly points to the platform as an important source of variation in how complementors perform. One set of studies treats the platform mostly as a passive actor and focuses on the fit between the complement and a platform's technological core. Kapoor and

Agarwal (2017), for example, found that app developers in the iOS and Android app ecosystems are more likely to sustain their positions of superior performance when they hold greater platform-specific experience, especially when the platform's architectural complexity is high rather than low. In two separate studies, Tiwana (2015; 2018) similarly found that complements can have various degrees of fit—or synergy—with the platform's technological core, and that a stronger fit is generally associated with a complement's superior market performance.

A second set of studies looks at how the platform's deliberate actions affect complement producers. These studies focus on platforms' governance strategies—the set of rules that collectively impact the ecosystem's overall value creation potential and the extent that the platform sponsor captures a portion of this value (Ceccagnoli et al., 2012; Wareham et al., 2014)—and how these rules change over the course of the platform life cycle (Huber et al., 2017; Kyprianou, 2018). While no prior studies—to the best of our knowledge—have looked at the collective effects of a platform's evolving governance framework, research on specific instances of governance changes has documented the implications for complementors. In a study of Facebook, for example, Claussen et al. (2013) found that a rule change on the platform benefited some apps more than others. In their study of console video games, Rietveld et al. (2019) similarly found that a platform's selective promotion results in a boost in sales for promoted complements relative to non-promoted complements.⁴ Other work documented how governance strategies evolve at specific stages of the platform life cycle (Huber et al., 2017; Kyprianou, 2018) without explicitly addressing the implications for complementors.

While it is apparent that a platform sponsor's governance strategies can have important implications for complement producers, empirical evidence of this is limited to isolated instances of governance changes, mostly in the context of a single platform. Moreover, it is

⁴ A related literature looks at how the platform's corporate scope affects complementors. This literature finds that a platform's vertical integration into the complement space affects complementors' value capture strategies and innovation incentives (e.g., Foerderer et al., 2018; Pierce, 2009; Wen and Zhu, 2019; Zhu and Liu, 2018).

unclear how governance strategies evolve as a platform becomes increasingly dominant. For these reasons, we next report results from an exploratory multiple case study that yields insight into both how a platform's governance strategies are likely to evolve as it becomes increasingly dominant, and how such changes are associated with complementor performance outcomes.

METHODOLOGY

To develop a deeper understanding of how platform dominance influences complementor performance outcomes, we conducted an exploratory multiple case study combining qualitative data with longitudinal quantitative datasets from four digital platform ecosystems (discussed below). Case based research is well-suited for studying emerging phenomena with the purpose of developing novel theoretical insights (Eisenhardt, 1989), especially when the phenomenon is dynamically evolving over time (Langley, 1999). Multiple case studies generally provide a stronger basis for theoretical inference than single case studies, given that they facilitate cross-case replication logic and provide insight into whether findings are “idiosyncratic to a single case or consistently replicated by several cases” (Eisenhardt and Graebner, 2007: 27).

Case Selection

We relied on theoretical sampling for our case selection (Eisenhardt and Graebner, 2007). Our interest in platforms' dominance trajectories directed us to look for extreme cases of platforms that displayed exponential growth of users on both sides of the platform, and controlled a significant share of their respective markets at the time of data collection (Eisenhardt, 1989; Yin, 2017). Similar to prior case study research on platform-complementor dynamics (e.g., Huber et al., 2017; Kyprianou, 2018; Wareham et al., 2014), our observations of interest are embedded within each of the cases.

To confront concerns related to the generalizability of our findings and rule out alternative explanations, we selected cases from different industry backgrounds with different founding dates and different geographical foci (Yin, 2017). Studying platforms from different industries enabled us to isolate industry-specific trends and improve the transferability of our findings. Similarly, choosing cases with different founding dates and geographical foci allowed us to separate platform dynamics from changes at the macro-economic level. Finally, we selected platforms with a significant history, which has been documented in publicly available records, allowing us to retrace their evolution over a period of multiple years.

These criteria culminated in the selection of four platform ecosystems: Apple's iOS App Store, Kickstarter, Kiva, and Valve's Steam (see Table 1). Our case selection is suitable for generating novel theoretical insights about platform dominance and the mechanisms by which it affects complementor performance outcomes. First, the platforms in our sample are all organized around a digital technological core and are sponsored by a lead firm. Second, complementors make platform-specific investments, which points to a degree of interdependency between the platform sponsor and complement producers (Cennamo, 2019; Jacobides et al., 2018). Third, consistent with the literature on platform dominance (Schilling, 1998; Suarez, 2004), across all four platforms we note consistent growth rates in the number of complements in lockstep with the number of end users adopting the platform (see Figure 1).

--- INSERT TABLE 1 AND FIGURE 1 ABOUT HERE ---

Data Sources

We draw from multiple data sources, the majority of which are publicly available. Our data collection period ranged from 61 months to 144 months per platform, depending on cases' founding dates and their data availability. For each of the platforms in our sample, we collected secondary qualitative data and longitudinal quantitative data, which we describe below.

Qualitative data sources. For each platform, we collected qualitative data from 446 archival documents released during our study's time period. We broadly distinguish between two types of qualitative data sources. First, we collected data from communications issued directly by the platform sponsor (e.g., annual reports, official announcements, blog posts). This information helped us develop timelines and identify relevant updates that potentially impacted complementors' performance outcomes. Second, we collected documents published by specialized trade publications such as TechCrunch, MacRumors, and Polygon. This second set of data contains expert interpretations, interviews with complementors, and other information that we used to deepen our understanding of each of the four cases. While collecting our data, we also spent significant time (as end users) on each of the platforms in our sample.

Quantitative data sources. We collected monthly time series observations on the number of end users, the number of complement producers, and the number of complements for all platforms. In some cases, these data were readily available from the platform's website, while in other cases we had to manually retrieve and combine these data using digital libraries such as the Internet Archive's Wayback Machine. We collected several additional data points on complements, including various measures of performance (e.g., downloads, amount pledged, funding rates). For Kiva and Steam, we obtained granular complement level data, such as the time it takes for a loan to receive funding or the number of downloads for video games. Complement performance data for Apple and Kickstarter are aggregated at the platform-month level. Finally, we obtained a number of proprietary datasets from specialized data vendors (e.g., SuperData) including information on value appropriation outcomes, such as the cost of acquiring end users, complement prices, and average revenue per end user.

Data Analysis

By combining insights from our qualitative and quantitative data analysis, we aimed to triangulate our findings and strengthen the empirical foundation of our discoveries (see Table 2). Below we document the primary steps in our analytical process.

--- INSERT TABLE 2 ABOUT HERE---

Event timelines and case histories. We began by reconstructing the evolution of each of the platforms in our sample. To this end, we developed case histories and timelines of relevant events (Langley, 1999). We began by plotting platforms' demand and supply side evolutions to confirm their ongoing dominance trajectories (Figure 1). We then engaged in a thorough reading of our archival data to identify governance changes as well as other events of interest through open coding procedures (Corbin and Strauss, 1990; Eisenhardt, 1989).

Identification and interpretation of governance changes. Next, we zoomed in on platforms' evolving governance strategies. Among the four platforms, we identified 155 individual governance changes from our qualitative data sources. Two authors interpreted each of these governance changes and assigned them into groupings based on intention. This led to the emergence of eight intention categories (as documented in Figure 2). For example, the introduction of dashboards containing information on end users and the release of application programming interfaces (APIs)—both of which occurred on all four platforms—were categorized as governance changes with the intention of increasing the (quality of) information available to complementors. We repeated this step several times to improve the accuracy and consistency of our coding structure. The third author was kept out of the coding activity at first, allowing them to act as “Devil’s advocate” in the evaluation of our assigned codes thereafter (Eisenhardt, 1989). The author team finally collapsed the eight intention categories into three aggregate governance types as documented in our coding structure in Figure 2.

---INSERT FIGURE 2 ABOUT HERE---

Linking governance changes to complementor performance outcomes. We then linked the three aggregate governance types with several measures of complement performance. First, we examined whether longitudinal shifts in complementor performance (e.g., sudden dips in loan funding rates or spikes in game downloads) could be traced back to any of the governance changes in our timelines (e.g., see Figures 5 and 6). We also checked if the direction of these shifts was consistent with our interpretation of the change. Second, we relied on our qualitative data sources to understand how complementors, industry experts, and platform sponsors interpreted governance changes and whether these interpretations were consistent with the trends in our data (see Table 4). From this we created connections between platforms' evolving governance strategies and complementor performance outcomes.

Cross case analysis. Finally, we used pattern matching to identify consistencies and variations across cases (Miles and Huberman, 1994; Yin, 2017). Notwithstanding a high level of coherence among the four platforms, we observed that Apple and Valve introduced more—and more impactful—governance changes compared to Kickstarter and Kiva (see Figure 3). Our cases differ in the extent that the platform sponsor is oriented toward appropriating value for its shareholders as opposed to contributing to public welfare. Kiva is a non-profit organization while Kickstarter is a public benefit corporation that allows public benefit to be a charter purpose in addition to shareholder wealth creation.⁵ Apple and Valve's legal structures, on the other hand, dictate that they are fully dedicated to maximizing shareholder value. Despite not being part of initial our coding efforts, these different orientations on value appropriation emerged from our analyses as a theoretically relevant dimension (Miles and

⁵ The public benefit corporation (or, benefit corporation), is a “legal business entity that is obligated to pursue public benefit in addition to the responsibility to return profits to shareholders. It is legally a for-profit, socially obligated, corporate form of business, with all the traditional corporate characteristics combined with societal responsibilities” (Hiller, 2013; p. 287). Benefit corporations are recognized as a legal corporate structure in several countries, including Canada, United Kingdom, and several states within the United States.

Huberman, 1994; Yin, 2017). From this we induced that a platform's evolving governance strategy is partly motivated by the platform sponsor's orientation on value appropriation.

--- INSERT FIGURE 3 HERE ---

FINDINGS

We organize our findings into three sections. We begin by outlining platforms' evolving governance strategies by identifying three distinct governance changes. We then illustrate how governance varies with the platform sponsor's value appropriation orientation. Finally, we document how the amount and distribution of value captured by complementors evolved and how these dynamics are associated with platforms' evolving governance strategies.

Platforms' Evolving Governance Strategies

We associate platforms' increasing dominance positions with a shift in governance strategies. Specifically, our analyses revealed three distinct types of governance changes: *structural governance changes*, *boundary spanning governance changes*, and *redistributive governance changes*. While the progression of these governance types is not strictly sequential, we observed that platforms implemented most structural governance changes earlier in their dominance trajectories. This was followed by an increase in boundary spanning governance changes, while the majority of redistributive governance changes was implemented later in platforms' dominance trajectories. We conceptualize and depict this progression in Figure 4.

--- INSERT FIGURE 4 ABOUT HERE ---

Structural governance changes. Structural governance changes involve updates to the platform's technological core and are aimed at improving market conditions for complementors in three possible ways. First, structural governance changes increase complementors' opportunities for value creation and value capture. Examples include Apple introducing in-app

advertising as an additional source of revenue and Valve facilitating microtransactions, allowing game developers to implement the freemium business model. Second, structural governance changes entail changes to the platform’s pricing structure, mostly to the benefit of complementors. Examples include Kiva shifting currency devaluation risks away from Field Partners toward lenders and Apple imposing minimum price levels for apps that vary across countries. Third, structural governance changes increase the amount and quality of information about end users available to complementors. Examples include Kickstarter’s introduction of an analytics dashboard providing project creators with information on backers and Apple enabling developers to beta test their apps ahead of release. Of the 155 governance changes in our dataset, 43 were coded as structural (see Table 3). These changes mostly occurred in the early stages of a platform’s dominance trajectory and largely benefitted existing complementors.

Boundary spanning governance changes. Boundary spanning governance changes are aimed at increasing both the depth and breadth of the complement pool in the ecosystem by expanding a platform’s boundaries. These modifications facilitate additional complementor entry, for example, by shifting from a manual submission screening process for new entrants to an automated or crowd-sourced submission screening procedure. Figure 5 illustrates how entry rates for games on Steam increased dramatically after Valve introduced the Greenlight feature in 2012, which relegated the screening of new games to end users. A similar shift occurred on Kickstarter with the introduction of Launch Now in 2014. This feature transformed Kickstarter’s manual screening of new projects into an algorithmic screening procedure.

--- INSERT FIGURE 5 ABOUT HERE ---

Increasing the breadth of the complement pool typically occurred by way of introducing novel complement categories, such as Apple’s “kids” and “shopping” categories for software applications and Kiva’s “study” and “water” categories for micro-loans.

In order to curtail opportunistic behavior that inevitably arises when entry barriers are reduced (e.g., Geva, Barzilay and Oestreicher-Singer, 2019; Luca and Zervas, 2016), the platforms in our sample implemented several measures aimed at restricting complementors' autonomy. Kickstarter, for example, prohibited simulations and virtual renderings as promotional tools for project creators, while Apple and Valve both placed restrictions on who can submit app or game reviews after an influx of fake reviews. Out of 155 governance changes, 45 were coded as boundary spanning (see Table 3). The bulk of these changes occurred after the platform had improved its market conditions for existing complementors.

Redistributive governance changes. Redistributive governance changes are aimed at directing end users in their search and decision-making processes on the platform. One way platforms redirect end users' attention is through selective promotion of complements—be it in the form of curated selections (e.g., Kiva's Social Performance Badges, Kickstarter's Projects We Love, and the App Store's Editor's Choice lists) or algorithmic recommender systems (e.g., Steam's Discovery Updates). Redistributive governance changes further facilitate end users in their search and selection processes by providing additional information on complements such as age ratings for apps on the App Store and Field Partner risk ratings on Kiva, or by providing new ways to browse the complement portfolio (e.g., Kickstarter's content tags, improved search functionalities, and creator pages). Still other redistributive governance changes are aimed at empowering end users, for example, by allowing them to gift or donate complements (such as the App Store's gift functionality or Kiva's dedicated loans), or by providing end users the possibility to request to refund their purchases. The focus on redistributive governance updates grew larger as platforms became increasingly dominant. Out of 155 governance changes, 67 were coded as redistributive in our dataset (see Table 3).

--- INSERT TABLE 3 ABOUT HERE ---

Cross Platform Variation

While we note strong evidence for the aforementioned governance changes and their evolutionary patterns within each of our platforms, we also observe some variation across cases in the amount and impact of these updates (see Figures 3 and 4). Apple, for example, implemented the largest number of governance changes. Moreover, Apple was also the most aggressive platform sponsor both in terms of directing end users in their choice of complements on the platform and in terms of implementing governance changes aimed at enhancing its own value capture—at the cost of app developers on the platform.⁶ This was followed by Valve, as Valve redirects end users' attention via its various Discovery Updates and actively competes in the complementor market by publishing its own video games. Steam's recommender systems give preferential treatment to the most popular video games on the platform—including Valve's own games. These redistributive patterns were much less pronounced on Kickstarter, and even less so on Kiva, where most of the governance changes were aimed increasing the overall value created and improving market conditions for complementors. This variation in platform sponsors' governance strategies mirrors their value appropriation orientation, such that platform sponsors with a stronger fiduciary duty to maximize value for shareholders (i.e., Apple and Valve) are more active in updating and refining their governance strategies than platform sponsors with a (partial) public welfare orientation (i.e., Kiva and Kickstarter).

Implications for Complementor Performance Outcomes

When we mapped platforms' evolving governance strategies onto complementors' performance outcomes we identified three interrelated patterns: 1) the average demand for

⁶ Among the various governance updates, some changes were unilaterally increasing the value captured by the platform sponsor, at the expense of complement producers. Examples include Apple charging app developers for preferential listing in search results (a structural governance change), or banning certain apps that head-on compete with Apple's own apps or functionality integrated in the iOS operating system (a boundary spanning change). We found more of such value appropriation governance changes on the App Store and Steam than on Kickstarter and Kiva. These changes are coded as a subset of our aggregate governance types.

individual complements declined; 2) the demand for complements became increasingly concentrated; and, 3) complementors' value capture became compromised.

Average demand for individual complements declines. First, while the value created at the overall ecosystem level may increase as a result of platforms' dominance trajectories and the resulting changes in governance strategy, we find that the average demand at the individual complement level decreases when a platform becomes increasingly dominant.⁷ On Kickstarter, for example, we note that the monthly average success rates for creative projects decreased from 42% in 2014 to 35% in 2017 (see Figure 6), meaning that fewer projects reached their funding goals. Notably, the sharp drop in success rates in June 2014 coincides with Kickstarter's implementation of Launch Now, wherein the platform transitioned from a manual submission screening procedure to an algorithmic screening process for creative projects.

--- INSERT FIGURE 6 ABOUT HERE ---

The other three platforms exhibit similar declines. On Steam we find that median downloads for paid video games declined exponentially during our study period. A typical paid game released in 2007 generated 713,959 downloads. This number dropped to 633,552 downloads for games released in 2011, and plummeted to 74,361 downloads for games released in 2015. Further analysis shows that this decline is not exclusively driven by a "late complementor" effect (i.e., low quality game developers entering the platform later, facilitated by lower entry barriers), given that many games by early entrants that were released later in the platform life cycle were also subject to this decline. Furthermore, and as noted before, all platforms implemented governance changes intended to combat opportunistic behavior and maintain a modicum of quality control. On Kiva, too, the average time it took for a loan to get funded, a key performance indicator given that nearly all loans receive funding (Allison et al.,

⁷ For example, the cumulative downloads for all games released in the same year on Steam increased from approximately 45 million downloads for games released in 2006 to nearly 329 million downloads for games released in 2016. We observe similar trends for the amount of time that games were played.

2015; Galak, Small and Stephen, 2011), increased. In 2007, it took 1.18 days for a loan to get funded, whereas in 2014 this increased to 8.57 days, despite an uptake in the number of lenders on the platform. While we do not have access to granular download or revenue data for apps released on the App Store, our qualitative data suggest that here, too, the average revenue and download performance of apps dropped as the platform evolved. Table 4 provides illustrative quotes from our qualitative data in support of each of the main findings in this section.

--- INSERT TABLE 4 ABOUT HERE ---

Demand for complements becomes more concentrated. Second, the distribution of the demand for complements became increasingly skewed. That is, a small group of highly successful complements significantly grew their share of the total value created in the ecosystem. This is aptly illustrated by Figure 7, which depicts the share of downloads for video games released on Steam in a given year, broken out by percentage-based performance ranks as a function of the cumulative downloads by all video games released in the same year. For example, the figure shows that in 2007 the top 20% most downloaded games accounted for approximately 66% of all downloads by video games released in that year. The share of downloads by the top 20% most downloaded video games increased to nearly 90% in 2016. In other words, out of 4,380 games released in 2016, 870 games accounted for 90% of the 329 million downloads for all games released that year. The growing disparity between the top and bottom video games in 2014 coincides with Valve's Discovery Update, a governance change aimed at improving the discoverability of the most popular games on the platform.

--- INSERT FIGURE 7 ABOUT HERE ---

This growing disproportionality is not exclusive to Steam. Kiva follows a similar trend. While the overall skewness of demand for micro-loans is less pronounced, we do find that the share of total dollars lent to successfully funded loans by the top 20% Field Partners increased from 42% in 2012 to 66% in 2014. On Kickstarter, too, we observe that the share of successful

projects raising over \$100,000 USD grew by 302% from 2012 to 2017, whereas the share of successful projects raising less than \$100,000 USD fell by 17% during that same period (see Figure 6).⁸ Two of Kickstarter’s redistributive governance changes—the introduction of Discovery pages and Projects We Love—appear to have contributed to the increase in concentration of demand for popular projects on the platform. Combined with our finding of lower average success rates, these findings suggest that end users are becoming more homogenous in their choice of complements on the platform. This is consistent with the notion of platform sponsors redirecting their end users through redistributive governance changes.

Value capture for complements is compromised. Third, we find that complement prices decline whereas the costs complementors incur increase. On the App Store, for example, prices for apps have been in decline since 2009. The left-hand panel in Figure 8 shows that the average price for game apps fell by 60%, from \$1.37 USD in 2009 to \$0.55 USD in 2016. While this trend can be partly explained by the increasing popularity of the freemium business model, which lets users download apps free of charge and generates revenue from in-app purchases and in-app advertising, research has shown that consumers have lower willingness-to-pay for freemium apps (Arora, Ter Hofstede and Mahajan, 2017; Rietveld, 2018), as well as for apps with in-app advertisements (Ghose and Han, 2014). Additionally, the right-hand panel in Figure 8 shows that the cost per install, or the advertising expenses associated with one additional app download, increased at a much steeper rate than the average revenue per app user.

--- INSERT FIGURE 8 ABOUT HERE ---

We find similar indicators on other platforms. For example, Kiva reports profitability rates for Field Partners as measured by their return on assets. Our data suggest that Field Partners’ average profitability rates decreased by 940% from 2010 to 2014, to the point where

⁸ Across all platforms we observed several cases of late entrants producing highly successful complements. For example, in 2015, first-time Kickstarter creator Elan Lee launched a campaign for *Exploding Kittens*, a card game that quickly became the most-backed Kickstarter project to date. This, again, suggests that these effects are not solely driven by early entrants solidifying their positions at the expense of late entrants on the platform.

many Field Partners were incurring losses later in the platform's life cycle. It thus becomes increasingly difficult for complementors to appropriate value. While we cannot unambiguously point to the cause of this decline in value capture, we observe that in some instances value is increasingly ceded to the platform sponsor. For instance, in 2006 the average paid video game by Valve had 13.57 times as many downloads as a typical paid video game by an external game developer, while in 2012 this had grown to 56.42 times as many downloads—implying that value capture has shifted away from external game developers to the platform sponsor.

Synthesis

Platform sponsors benefit unequivocally from the three types of governance changes, whereas the effects on complementors are mixed: Structural governance changes increase the value captured by the platform sponsor by way of enlarged transaction volume and for individual complementors by way of improved market conditions. Boundary spanning governance changes benefit the platform sponsor by growing the total number of transactions from adding more (diverse) complements. Since these changes increase competitive crowding, however, they dampen performance outcomes at the individual complement level. Finally, redistributive governance changes shuffle around part of the value created and captured by drawing attention to some complements at the cost of others. While this may have a value increasing effect at the ecosystem level through improved matching of complements to end users, resulting in a larger volume or amount of transactions, the increase in value is mostly captured by the platform—as well as by those complementors to which attention is drawn. Given that platform sponsors increase the amount of value they create—and thus capture—through these governance changes, we can see why their enactment is more pronounced on those platforms with a stronger (rather than weaker) orientation on value appropriation. In sum, while a platform's

evolving governance strategies may make the ecosystem as a whole more generative, it reduces individual complementor performance outcomes and skews the distribution of value capture.

DISCUSSION

Multi-sided platforms not only solidify their market position when they gain users, they also strengthen their position vis-à-vis the users in the ecosystem. Growth in demand and supply side users both enables and necessitates a platform sponsor to update its governance framework—the set of rules that collectively impact the ecosystem’s overall value creation potential and the extent that the platform sponsor captures a portion of this value. In a multiple case study on four market leading digital platform ecosystems we have sought to understand how a platform’s governance strategies evolve as it solidifies its position in the market, and how this is associated with changing value capture dynamics for complement producers.

Our findings point to a shift in how a platform sponsor orchestrates its ecosystem. While the platform sponsors in our sample implemented several governance changes throughout their dominance trajectories, the nature of these changes evolved as they became more dominant. Initially, many governance changes were structural, aimed at improving market conditions for existing complementors. To stimulate further entry by complementors, however, platforms transitioned to implement more governance changes aimed at both deepening and broadening the complement pool. Following this, platforms shifted their focus by implementing redistributive governance changes aimed at facilitating and directing end users in their choice of complements. The extent of these changes was affected by the platform’s orientation on value appropriation. Platforms with a stronger focus on maximizing shareholder value implemented more governance changes than platforms with a public welfare orientation, and these changes were also more often aimed at increasing the platform’s value capture.

When we mapped these changes in platform governance strategies onto performance outcomes for complementors we identified three interrelated dynamics. First, while the value created at the overall ecosystem level increased, the average demand at the complement level decreased as platforms became more dominant. We found that complements' success rates declined as the platform shifted its governance strategies from being largely supportive of existing complementors to becoming more focused on soliciting additional entry by complementors. Second, as platform sponsors increasingly implemented redistributive governance updates aimed at directing end users in their choice of complements, the discrepancy between the top and the bottom performing complements widened, leading to a more concentrated distribution of demand for complements. Third, prices for complements decreased while the costs complementors incurred increased, suggesting a drop in value captured by complementors. The latter dynamic suggests a shift in value captured away from complementors toward end users (in the form of consumer surplus) and the platform sponsor.

We believe our findings offer an important extension to our understanding of platform strategy, particularly in digital contexts where platforms can more readily implement governance changes. While we are not the first to point to the effects of a platform's orchestration efforts on complementors (e.g., Claussen et al., 2013; Rietveld et al., 2019), we are among the first to study patterns of platform governance dynamics over time (also see: Huber et al., 2017; Kyprianou, 2018), and their consequences, across multiple industry contexts. Applying a temporal lens revealed important insights about the types of governance changes platforms implement, and how such changes differently affect complement producers in the ecosystem. Indeed, the classification of three types of governance changes (i.e., structural, boundary spanning, and redistributive) and their manifestation across the platform's dominance trajectory may help explain why some studies have pointed to positive effects of platform governance changes on complementors, whereas others reported negative effects.

Contributions to the Platform Governance Literature

Platform sponsors have their own strategic objectives, which often stem from their mission and value appropriation orientation. These objectives influence how a platform sponsor governs its ecosystem (Adner, 2017; Cusumano et al., 2019; Jacobides et al., 2018). Having said that, a platform sponsor is constrained in its orchestration efforts by the extent that it has garnered support from end users and complement producers (Huber et al., 2017; Johns, 2006; Kyprianou, 2018). Early on, a platform sponsor is in a precarious position as it needs to attract and retain users to initiate the platform's dominance trajectory. In the absence of formal control mechanisms, a platform sponsor must put in place a governance framework that will entice complementors to join and produce high quality complements to boost the ecosystem's appeal. However, once many complementors have joined and users are locked-in, the platform sponsor can shift its focus to fulfill its own strategic objectives, by implementing corresponding updates to its governance strategy. Our findings of how governance strategies evolve thus add further weight to the claim that successfully managing a platform ecosystem is an inherently dynamic process (Gawer, 2014; Tiwana et al., 2010). Moreover, we provided exploratory evidence that variation in governance strategies is associated with firm-level factors for platform sponsors.

Contributions to the Orchestration of Innovation Networks Literature

There are important links between our work on platform governance and the orchestration of innovation networks literature. Both start from the notion of a powerful hub firm managing a large number of innovation partners (e.g., Giudici et al., 2018; Nambisan and Sawhney, 2011). Similar to the platform literature, there is growing awareness that the hub firm's orchestration efforts must evolve over time for the network to remain generative (Paquin and Howard-Grenville, 2013). Our work makes two contributions to this body of work. First, while we know that the hub firm's orchestration efforts are partly driven by the objective to extract value from

the network (Dhanaraj and Parkhe, 2006), our findings suggest that the hub firm's value appropriation orientation is associated with how it orchestrates its network of innovation partners. The more a hub firm is focused on value appropriation, the more changes it implements to how it orchestrates the network. Second, while the innovation networks literature points to the hub firm's obligation to ensure an equitable distribution of value among the network's members (Dhanaraj and Parkhe, 2006), our findings suggest the contrary: The hub firm's orchestration efforts contributed to an increasingly uneven distribution of value. One potential explanation for this finding is that not all members contributed equally to the network's overall offering. Moreover, a platform ecosystem's value proposition is based on modular heterogeneous complements, whereas the value proposition for ecosystems not organized around a stable technological core is more tightly integrated (Adner and Kapoor, 2010). We invite researchers to further explore the linkages between these related literatures.

Contributions to the Complementor Literature

Lastly, our findings contribute to the literature on platform complementors. Whereas conventional wisdom suggests that complementors are best positioned entering the dominant platform(s) in a market (e.g., Venkatraman and Lee, 2004), such a strategy may not uniformly translate into superior market performance. Our findings suggest that the likelihood of capturing value for complementors is greater during the early stages of a platform's dominance trajectory, when competition is less intense and the platform has a stronger dependency on complementors. In addition to our finding that average success rates are higher when the ecosystem is still nascent, prior work by Boudreau (2012) and Rietveld and Eggers (2018) suggests that there are other benefits to entering early (also see Suarez and Lanzolla, 2007). In light of our findings, these entail complementors learning how to "deal" with the platform or cultivating a favorable relationship with the platform sponsor, both of which may translate into

selective promotion or preferential treatment later in the platform's life cycle. Late entrants face a more concentrated demand for complements and must adjust their strategies accordingly. Beyond installed base effects and competition, complementors must thus carefully evaluate a platform's evolving governance framework when deciding which platforms to enter and when.

Boundary conditions, limitations and future research

While our findings do not exclusively pertain to platforms organized around a *digital* technological core, they certainly are more salient in the era of digital transformation. For one, digital technologies have made it easier for activities to be organized around platforms, as witnessed by the recent proliferation of the platform business model (e.g., Adner, Puranam and Zhu, 2019; Cennamo, 2019; Cusumano et al., 2019). Additionally, digital technologies have changed the notion of generational transitions in platform markets. Non-digital platforms are often punctuated by sharp generational breaks triggered by external technological change and the threat of displacement (Cennamo, 2018; Kretschmer and Claussen, 2016). In the face of such generational transitions, positions of dominance are inherently transient and platforms' life cycles are finite. Digital technologies, on the other hand, allow platform sponsors to extend their platforms' life cycles virtually *ad infinitum* by issuing constant updates and improvements to a platform's technological core. This means that digital platforms' market positions are stickier, making it even harder to dislodge a dominant platform (Suarez and Kirtley, 2012).

One topic for future research is to establish what constitutes "good" governance and whether the strategies documented here may be potentially harmful to the ecosystem's generativity in the long run. Notwithstanding an overall increase in value creation at the ecosystem level, across all cases we found complementors expressing their discontent over how their platforms evolved. One project creator alleged that the Kickstarter platform had

become “corrupted” and that the platform “isn’t what it used to be”.⁹ Such perceptions can be problematic if they prevent existing complementors from developing novel complements or thwart new entrants from joining a platform. Van Alstyne, Parker and Choudary (2016) offer three rules for good platform governance: 1) governance must always create value for the platform’s end users; 2) governance must not unilaterally favor the platform sponsor; and, 3) governance must result in a fair distribution of value. Similarly, Tiwana et al. (2010) note that a platform can have too much, too little, or the theoretically elusive “just-right” level of governance. There is considerably more research to be done on how platform governance strategies impact a platform’s ability to remain generative and attractive for its users.

Another topic for further investigation is the impact of platform competition on the leverage a platform sponsor has over its users, and how this affects its governance strategies. A platform with a smaller pool of users may still hold significant bargaining power in the absence of viable alternatives. Likewise, a platform with a large user base may struggle to wield leverage over its users if it is engaged in a fierce battle over market share. Valve, for example, recently updated Steam’s distribution agreement in direct response to entry by the Epic Games Store, which is attempting to sway developers by offering a competitive 12% revenue share. Valve responded by introducing a tiered revenue split where it demands a progressively lower percentage of a game’s sales: The standard revenue split of 30% now drops to 25% for games with sales in excess of \$10 million and to 20% for games with sales over \$50 million. Future research may want to exploit such market shocks as a trigger for platforms to reevaluate their governance strategies and analyze how any resulting changes affect complementors.

Additionally, it would be valuable to explore governance strategies in the context of platforms that are being displaced by superior alternatives. All technologies eventually are displaced as the market shifts to a new dominant design (Tushman and Anderson, 1986). In

⁹ https://www.huffpost.com/entry/why-kickstarter-is-corrup_b_8111662?guccounter=2 – Accessed: May, 2020.

some cases, displaced technologies will continue to exist by catering to a contracted segment of underserved customers (Adner and Snow, 2010), and may eventually even reemerge as they rebuild and expand their niche of devoted customers (Raffaelli, 2018). The platforms in our sample were all market leaders and did not show any signs of being displaced by a disruptive rival. Future research may look at how platform sponsors can delay displacement through updating their governance strategies, what governance entails during a platform's decline, and how governance can contribute to a platform's successful retrenchment or reemergence.

Finally, our study comes with some limitations. Importantly, our case selection lacks within-industry variation. This implies that any cross-case variation in our findings cannot be fully separated from potential industry-specific effects. Moreover, we are cognizant that there are other dimensions along which our cases differ, such as the fact that apps and games on the App Store and Steam have virtually unlimited lifespans whereas loans and projects on Kiva and Kickstarter disappear from the platform after their funding cycles have ended. This potentially results in a less congested complementor market, somewhat alleviating the need for certain governance changes. It should be noted, however, that most video games generate the bulk of their revenues shortly after release (Nair, 2007). Despite their virtually unlimited lifespan, many video games thus only actively compete on the platform for a very short amount of time. These differences also imply a clear dichotomy between the App Store and Steam on one side and Kiva and Kickstarter on the other side. This goes against our findings on value appropriation orientation, which suggest a more continuous source of variation. Most importantly perhaps, from the platform sponsor's perspective, there is a value appropriation element embedded in many of the governance changes. Unlocking novel business models, lowering entry barriers, and increasing customer satisfaction all benefit the platform sponsor in one way or another. Many of these changes will thus be motivated, at least in part, by the

platform sponsor's value appropriation orientation. That said, we cannot fully rule out any of these alternative explanations and we call on future research to further unpick these findings.

CONCLUSION

Multi-sided platforms critically depend on the support of users on both sides of the market. Sufficient levels of participation by end users and complementors can set in motion a virtuous cycle that manifests a platform's position of power, both externally (vis-à-vis other platforms in the market) and internally (vis-à-vis users in the ecosystem). Conducting a multiple case study on four market leading platform ecosystems, we explored how a platform's increasingly dominant market position impacts performance outcomes for complementors.

While it is typically assumed that complementors are best positioned by entering a dominant platform, we discovered that the average demand for complements in such platforms is, in fact, lower and that the distribution of demand is disproportionately skewed. Our findings further suggest that complementors' ability to capture value is compromised as a platform becomes increasingly dominant. While shifting consumer preferences and increased competition from rival complementors are part of the explanation, we suggest that these findings are importantly associated with the platform sponsor's governance framework shifting from being mostly supportive of all complements to becoming more selective and more geared toward end users. These findings advance our understanding of how complementors capture value and how such dynamics are shaped by the platform's dominance trajectory.

REFERENCES

- Adner, R. 2017. Ecosystem as structure: An actionable construct for strategy. *Journal of management*, 43: 39-58.
- Adner, R., & Kapoor, R. 2010. Value creation in innovation ecosystems: How the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal*, 31: 306-333.

- Adner, R., Puranam, P., & Zhu, F. 2019. What Is Different About Digital Strategy? From Quantitative to Qualitative Change. *Strategy Science*, 4: 253-261.
- Adner, R., & Snow, D. 2010. Old technology responses to new technology threats: demand heterogeneity and technology retreats. *Industrial and Corporate Change*, 19: 1655-1675.
- Allison, T. H., Davis, B. C., Short, J. C., & Webb, J. W. 2015. Crowdfunding in a prosocial microlending environment: Examining the role of intrinsic versus extrinsic cues. *Entrepreneurship Theory and Practice*, 39: 53-73.
- Anderson, P., & Tushman, M. L. 1990. Technological discontinuities and dominant designs: A cyclical model of technological change. *Administrative Science Quarterly*, 35: 604-633.
- Arora, S., Ter Hofstede, F., & Mahajan, V. 2017. The implications of offering free versions for the performance of paid mobile apps. *Journal of Marketing*, 81: 62-78.
- Arthur, W. B. 1989. Competing technologies, increasing returns, and lock-in by historical events. *The Economic Journal*, 99: 116-131.
- Bayus, B. L. 1987. Forecasting sales of new contingent products: An application to the compact disc market. *Journal of Product Innovation Management*, 4: 243-255.
- Boudreau, K. J. 2012. Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation. *Organization Science*, 23: 1409-1427.
- Boudreau, K. J., & Hagiu, A. 2009. Platform rules: Multi-sided platforms as regulators. *Platforms, Markets and Innovation*, 1: 163-191.
- Boudreau, K. J., & Jeppesen, L. B. 2015. Unpaid crowd complementors: The platform network effect mirage. *Strategic Management Journal*, 36: 1761-1777.
- Bresnahan, T. F., & Greenstein, S. 1999. Technological competition and the structure of the computer industry. *The Journal of Industrial Economics*, 47: 1-40.
- Cennamo, C. (2019). Competing in digital markets: A platform-based perspective. *Academy of Management Perspectives*, In press.
- Cennamo, C. 2018. Building the value of next-generation platforms: The paradox of diminishing returns. *Journal of Management*, 44: 3038-3069.
- Ceccagnoli, M., Forman, C., Huang, P., & Wu, D. J. 2012. Co-creation of value in a platform ecosystem: The case of enterprise software. *MIS Quarterly*, 36: 263-290.
- Claussen, J., Kretschmer, T., & Mayrhofer, P. 2013. The effects of rewarding user engagement: The case of Facebook apps. *Information Systems Research*, 24: 186-200.
- Clements, M. T., & Ohashi, H. 2005. Indirect network effects and the product cycle: video games in the US, 1994–2002. *The Journal of Industrial Economics*, 53: 515-542.
- Corbin, J. M., & Strauss, A. 1990. Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, 13: 3-21.
- Cusumano, M. A., & Gawer, A. 2002. The elements of platform leadership. *MIT Sloan Management Review*, 43: 51-58.
- Cusumano, M. A., Yoffie, D. B., & Gawer, A. 2019. *The business of platforms: Strategy in the age of digital competition, innovation, and power*. HarperCollins.
- Dhanaraj, C., & Parkhe, A. 2006. Orchestrating innovation networks. *Academy of Management Review*, 31: 659-669.
- Eckhardt, J. T. 2016. Welcome contributor or no price competitor? The competitive interaction of free and priced technologies. *Strategic Management Journal*, 37: 742-762.
- Eisenhardt, K. M. 1989. Building theories from case study research. *Academy of Management Review*, 14: 532-550.
- Eisenhardt, K. M., & Graebner, M. E. 2007. Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50: 25-32.

- Eisenmann, T. R., Parker, G., & Van Alstyne, M. W. 2006. Strategies for two sided markets. *Harvard Business Review*, 84: 92-103.
- Farrell, J., & Saloner, G. 1986. Installed base and compatibility: Innovation, product preannouncements, and predation. *The American Economic Review*, 76: 940-955.
- Foerderer, J., Kude, T., Mithas, S., & Heinzl, A. 2018. Does platform owner's entry crowd out innovation? Evidence from Google photos. *Information Systems Research*, 29: 444-460.
- Galak, J., Small, D., & Stephen, A. T. 2011. Microfinance decision making: A field study of prosocial lending. *Journal of Marketing Research*, 48: 130-137.
- Gawer, A. 2014. Bridging differing perspectives on technological platforms: Toward an integrative framework. *Research Policy*, 43: 1239-1249.
- Geva, H., Barzilay, O., & Oestreicher-Singer, G. 2019. A potato salad with a lemon twist: Using a supply-side shock to study the impact of opportunistic behavior on crowdfunding platforms. *MIS Quarterly*, 43: 1227-1248.
- Ghose, A., & Han, S. P. 2014. Estimating demand for mobile applications in the new economy. *Management Science*, 60: 1470-1488.
- Giudici, A., Reinmoeller, P., & Ravasi, D. 2018. Open-system orchestration as a relational source of sensing capabilities: Evidence from a venture association. *Academy of Management Journal*, 61: 1369-1402.
- Gupta, S., Jain, D. C., & Sawhney, M. S. 1999. Modeling the evolution of markets with indirect network externalities: An application to digital television. *Marketing Science*, 18: 396-416.
- Hiller, J. S. 2013. The benefit corporation and corporate social responsibility. *Journal of Business Ethics*, 118: 287-301.
- Huber, T. L., Kude, T., & Dibbern, J. 2017. Governance practices in platform ecosystems: Navigating tensions between cocreated value and governance costs. *Information Systems Research*, 28: 563-584.
- Iansiti, M., & Levien, R. 2004. Strategy as ecology. *Harvard Business Review*, 82: 68-81.
- Jacobides, M. G., Cennamo, C., & Gawer, A. 2018. Towards a theory of ecosystems. *Strategic Management Journal*, 39: 2255-2276.
- Johns, J. 2006. Video games production networks: Value capture, power relations and embeddedness. *Journal of Economic Geography*, 6: 151-180.
- Kapoor, R., & Agarwal, S. 2017. Sustaining superior performance in business ecosystems: Evidence from application software developers in the iOS and Android smartphone ecosystems. *Organization Science*, 28: 531-551.
- Katz, M. L., & Shapiro, C. 1985. Network externalities, competition, and compatibility. *American Economic Review*, 75: 424-440.
- Kretschmer, T., & Claussen, J. 2016. Generational transitions in platform markets—The role of backward compatibility. *Strategy Science*, 1: 90-104.
- Kyprianou, C. 2018. Creating value from the outside in or the inside out: How nascent intermediaries build peer-to-peer marketplaces. *Academy of Management Discoveries*, 4: 336-370.
- Langley, A. 1999. Strategies for theorizing from process data. *Academy of Management Review*, 24: 691-710.
- Lorenzoni, G., & Baden-Fuller, C. 1995. Creating a strategic center to manage a web of partners. *California Management Review*, 37: 146-163.
- Luca, M., & Zervas, G. 2016. Fake it till you make it: Reputation, competition, and Yelp review fraud. *Management Science*, 62: 3412-3427.

- Markovich, S., & Moenius, J. 2009. Winning while losing: Competition dynamics in the presence of indirect network effects. *International Journal of Industrial Organization*, 27: 346-357.
- McIntyre, D. P., & Srinivasan, A. 2017. Networks, platforms, and strategy: Emerging views and next steps. *Strategic Management Journal*, 38: 141-160.
- Miles, M. B., & Huberman, M. A. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks.
- Nair, H. 2007. Intertemporal price discrimination with forward-looking consumers: Application to the US market for console video-games. *Quantitative Marketing and Economics*, 5: 239-292.
- Nambisan, S., & Sawhney, M. 2011. Orchestration processes in network-centric innovation: Evidence from the field. *Academy of Management Perspectives*, 25: 40-57.
- Paquin, R. L., & Howard-Grenville, J. 2013. Blind dates and arranged marriages: Longitudinal processes of network orchestration. *Organization Studies*, 34: 1623-1653.
- Parker, G. G., & Van Alstyne, M. W. 2005. Two-sided network effects: A theory of information product design. *Management Science*, 51: 1494-1504.
- Peterson, R. A., & Mahajan, V. 1978. Multi-product growth models. *Research in Marketing*, 1: 1-23.
- Pierce, L. 2009. Big losses in ecosystem niches: How core firm decisions drive complementary product shakeouts. *Strategic Management Journal*, 30: 323-347.
- Raffaelli, R. 2018. Technology reemergence: Creating new value for old technologies in swiss mechanical watchmaking, 1970-2008. *Administrative Science Quarterly*, 64: 576-618.
- Rochet, J. C., & Tirole, J. 2003. Platform competition in two-sided markets. *Journal of the European Economic Association*, 1: 990-1029.
- Rogers, E. M. 2010. *Diffusion of Innovations*. Simon and Schuster.
- Rietveld, J. 2018. Creating and capturing value from freemium business models: A demand-side perspective. *Strategic Entrepreneurship Journal*, 12: 171-193.
- Rietveld, J., & Eggers, J. P. 2018. Demand heterogeneity in platform markets: Implications for complementors. *Organization Science*, 29: 304-322.
- Rietveld, J., Schilling, M. A., & Bellavitis, C. 2019. Platform strategy: Managing ecosystem value through selective promotion of complements. *Organization Science*, 30: 1125-1393.
- Schilling, M. A. 1998. Technological lockout: An integrative model of the economic and strategic factors driving technology success and failure. *Academy of Management Review*, 23: 267-284.
- Schilling, M. A. 2002. Technology success and failure in winner-take-all markets: The impact of learning orientation, timing, and network externalities. *Academy of Management Journal*, 45: 387-398.
- Schilling, M. A. 2003. Technological leapfrogging: Lessons from the US video game console industry. *California Management Review*, 45: 6-32.
- Suarez, F. F. 2004. Battles for technological dominance: an integrative framework. *Research Policy*, 33: 271-286.
- Suarez, F. F., & Kirtley, J. 2012. Dethroning an established platform. *MIT Sloan Management Review*, 53: 35-41.
- Suarez, F. F., & Lanzolla, G. 2007. The role of environmental dynamics in building a first mover advantage theory. *Academy of Management Review*, 32: 377-392.
- Suarez, F. F., & Utterback, J. M. 1995. Dominant designs and the survival of firms. *Strategic Management Journal*, 16: 415-430.
- Tiwana, A. 2013. *Platform ecosystems: Aligning architecture, governance, and strategy*. Morgan Kaufmann.

- Tiwana, A. 2015. Evolutionary competition in platform ecosystems. *Information Systems Research*, 26: 266-281.
- Tiwana, A. 2018. Platform synergy: Architectural origins and competitive consequences. *Information Systems Research*, 29: 829-848.
- Tiwana, A., Konsynski, B., & Bush, A. A. 2010. Research commentary—Platform evolution: Coevolution of platform architecture, governance, and environmental dynamics. *Information Systems Research*, 21: 675-687.
- Tushman, M. L., & Anderson, P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 31: 439-465.
- Wareham, J., Fox, P. B., & Cano Giner, J. L. 2014. Technology ecosystem governance. *Organization Science*, 25: 1195-1215.
- Wen, W., & Zhu, F. 2019. Threat of platform-owner entry and complementor responses: Evidence from the mobile app market. *Strategic Management Journal*, 40: 1336-1367.
- Van Alstyne, M. W., Parker, G. G., & Choudary, S. P. 2016. Pipelines, platforms, and the new rules of strategy. *Harvard Business Review*, 94: 54-62.
- Venkatraman, N., & Lee, C. H. 2004. Preferential linkage and network evolution: A conceptual model and empirical test in the US video game sector. *Academy of Management Journal*, 47: 876-892.
- Yin, R. K. 2017. *Case study research: Design and methods* (6th Ed.). SAGE publications.
- Yoffie, D. B., & Kwak, M. 2006. With friends like these: The art of managing complementors. *Harvard Business Review*, 84: 88-98.
- Zhu, F., & Liu, Q. 2018. Competing with complementors: An empirical look at Amazon.com. *Strategic Management Journal*, 39: 2618-2642.

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TABLES AND FIGURES

Table 1. Overview of Cases

Platform	Industry	Platform sponsor	Legal structure	Founded	Complementors (Complements)	End users	Data collection period	Data sources
<i>iOS App Store</i>	Mobile apps	Apple	Public	2008	Mobile app publishers (apps)	i-device users	Jul-2008 - Oct-2017 (102 months)	Apple, PocketGamer, FIKSU Analytics, App Annie, SuperData, various secondary online sources
<i>Kickstarter</i>	Crowdfunding	Kickstarter	Public-benefit	2009	Project creators (creative projects)	Project backers	Aug-2012 - Aug-2017 (61 months)	Kickstarter, Internet Archive (Wayback Machine), various secondary online sources
<i>Kiva</i>	Microfinance	Kiva.org	Non-profit	2005	Field Partners (micro-loans)	Microlenders	Apr-2005 - Dec-2014 (117 months)	Kiva, Kiva API, Internet Archive (Wayback Machine), various secondary online sources
<i>Steam</i>	PC video games	Valve	Private	2003 ^a	Game publishers (digital games)	Gamers	Jan-2005 - Dec-2016 (144 months)	Steam, SteamSpy, various secondary online sources

Note. Cases listed in alphabetical order.

^a Steam was founded in 2003 initially as a maintenance platform for Valve's internally developed games. It was opened to external game developers in 2005.

Table 2. Data Sources and Use in Analysis

Data types	Data sources	Use in analysis
<i>Qualitative data</i>	Platforms' annual reports and online archives (N=196) <ul style="list-style-type: none"> • Updates and governance changes implemented in the ecosystem • Relevant platform sponsor communications 	Create timelines of platforms' governance changes to map out evolutionary trajectories. Improve understanding of platforms.
	Trade publications (N=250) <ul style="list-style-type: none"> • Expert interpretations of governance changes • Complementor reactions to governance changes • General information on platforms 	Triangulate and reinforce patterns found in quantitative data on how complementors create and capture value. Develop understanding of platforms' overall evolution.
<i>Quantitative data</i>	Time series (monthly) of platforms' demand side users <ul style="list-style-type: none"> • Number of new users joining the platform (all platforms) • Cumulative number of end users on the platform (all platforms) 	Confirm platforms' ongoing dominance trajectories. Identify high level evolutionary dynamics of platforms' demand side users.
	Time series (monthly) of platforms' complementors <ul style="list-style-type: none"> • Number of new complements joining the platform (all platforms) • Cumulative number of complements on the platform (all platforms) 	Confirm platforms' ongoing dominance trajectories. Identify high level evolutionary dynamics of platforms' supply side users.
	Time series (monthly) of complement performance outcomes <ul style="list-style-type: none"> • Average success rates per complement type (Kickstarter) • Performance ranks per complement type (iOS App Store) 	Establish impact of platform governance on complementors' value creation and distribution of value. Triangulate patterns induced from qualitative data.
	Comprehensive complement level information (Steam and Kiva) <ul style="list-style-type: none"> • Complementor identification • Complement type (e.g., genre, loan category) • Various performance indicators (e.g., downloads, loan amount, price) 	Establish impact of platform governance on complementors' value creation and distribution. Distinguish longitudinal shifts. Check for complementor cohort effects. Triangulate from qualitative data.
	Time series of complements' costs and revenues <ul style="list-style-type: none"> • Monthly information on costs, prices and revenue per user (Apple) • Quarterly information on complementors' return on assets (Kiva) 	Establish the impact of platform governance on complementors' value capture. Triangulate patterns from qualitative data.

Note. All data sources were used and combined to develop extensive case description documents for each of the platforms in our sample.

Table 3. Examples of Governance Changes by Type and Platform (Sorted by Intention Categories)

Type of change	iOS App Store (N=70)	Kickstarter (N=29)	Kiva (N=23)	Steam (N=33)
<i>Structural governance changes</i> (N=43)	<ul style="list-style-type: none"> • Introduction of in-app purchases and in-app advertising (iAD) as novel revenue streams (VC) • Allow for bundling of multiple apps (VC) • Facilitate discounted bulk-selling of apps to educational institutions (PS) • Enable beta testing of unreleased apps (II) 	<ul style="list-style-type: none"> • Shorten maximum project length from 90 to 60 days (VC) • Enable multiple creators to jointly offer projects (VC) • Introduction of backer dashboard offering project creators improved insights on their backers (II) • Introduction of several tools (e.g., backer reports, surveys, and project dashboard) to help creators (II) 	<ul style="list-style-type: none"> • Introduction of Credit Limits program, giving Field Partners greater loan flexibility (VC) • Shift currency exchange losses of > 20% (later updated to > 10%) from Field Partners to lenders (PS) • Introduction of Field Partner API making loan submission process simpler and more efficient (II) 	<ul style="list-style-type: none"> • Introduction of in-game purchases, in-game economies, and Steam Wallet (VC) • Enable “modders” to sell their virtual creations on the Steam Workshop (VC) • Allow for bundling of multiple games (PS) • Introduction of Steamworks, system development kit for game developers (II)
<i>Boundary spanning governance changes</i> (N=45)	<ul style="list-style-type: none"> • Waive SDK licensing fees for amateurs and students (DP) • Introduction of several new app categories (e.g., kids, explicit, shopping, food and drinks) (BP) • Prevention and removal of fake reviews submitted on behalf of (or directly by) app developers (CO) • Ban several types of apps involved with malicious behavior (e.g., data stealing, cloning) (CO) 	<ul style="list-style-type: none"> • Introduction of Launch Now, automating submission screening of new projects (DP) • Introduction of journalism and crafts project categories (BP) • Ban simulations and renderings, creators can only promote projects using photos of actual prototypes (CO) • Enforce creators to list risks and challenges, and to complete projects and fulfil promised rewards (CO) 	<ul style="list-style-type: none"> • Add United States as a new geographical region for borrowers via Kiva.ZIP (DP) • Introduction of several new loan types (e.g., water loans, student loans) (BP) • Introduce periodic screening of Field Partners' risk rating and social performance scores (CO) 	<ul style="list-style-type: none"> • Introduction of Greenlight (and later Steam Direct) streamlining and automating the submission process for new video games (DP) • Allow non-game applications on Steam (BP) • Removal of fake reviews submitted on behalf of developers as well as several other changes to improve the video game review system (CO)
<i>Redistributive governance changes</i> (N=67)	<ul style="list-style-type: none"> • Introduction of age ratings, keywords, sub-categories, and tags to guide end users' selection of apps (SP) • Introduction of App of the Week, Best App of the Month, and Editor's Choice to highlight certain top apps (SP) • Introduction of 14 days no questions asked return policy on app purchases (FE) • Enable app gifting from one consumer to another, allow consumers to tip developers (FE) 	<ul style="list-style-type: none"> • Introduction of curated Discovery page and Projects We Love to selectively promote certain projects (SP) • Introduction of sub-categories, tags, search by creator, and advanced search options to guide backers (FE) • Implementation of Super Backers to reward and empower backers of > 25 projects in past year (FE) 	<ul style="list-style-type: none"> • Introduction of Social Performance badging system to highlight certain Field Partners (SP) • Enable lenders to self-organize around specific lending goals via lender teams (FE) • Allow lenders to automatically transfer repaid loan principals into new loans via Auto Loan (FE) • Implement Team Impact reports and lender portfolio dashboard for enhanced insights (FE) 	<ul style="list-style-type: none"> • Discovery Updates 1 and 2 to promote certain games based on prior popularity (SP) • Allow gamers to create in-game items and trade and (later) sell them (FE) • Introduction of 14 days no questions asked refund policy for games played < two hours (FE) • Enable gamers to create walkthroughs and guides and share these with other gamers (FE)

Note: VC = new value creation option for complementors; PS = price structure change; II = increase information available to complementors; DP = deepen complementor pool; BP = broaden complementor pool; CO = curtail opportunistic behavior; SP = selective promotion of complements; FE = facilitate and empower end users

Table 4. Illustrative Quotes for Complementor Performance Outcomes

Performance outcomes	iOS App Store	Kickstarter	Kiva	Steam
Average demand for individual complements declines	<i>No company has done as much damage to the perceived value of software, and the sustainability of being an independent developer, as Apple.</i> ¹ (Industry expert)	<i>While it was always going to be an utter rarity for a gaming campaign to make 3.3 million bucks now it seems it's much harder to simply succeed even with a fantastic pitch.</i> ² (Industry expert)	<i>Prior to 2012, fewer than 100 loans expired every year. Through the end of July 2012, just over 4,000 loans have expired, totaling \$5.9 million. The record levels of expirations can be attributed to the high volume of loans being posted to Kiva. This increase is primarily the result of our Field Partners' unexpectedly enthusiastic response to Kiva's Credit Limits program.</i> ³ (Platform sponsor)	<i>The launch of Steam Direct has done little to improve independent developers' chances of a strong launch on the leading PC games marketplace.</i> ⁴ (Industry expert)
Demand for complements becomes more concentrated	<i>While the App Store was once a relatively even playing field, with a balanced mix of indie developers, mid-size studios and large publishers, the storefront now suffers from increasing disparity, a problem that is suffocating for many developers, enthusiast media publications and the broader ecosystem.</i> ⁵ (Industry expert)	<i>I think it is getting harder and harder to get as heavily featured as we were in those early days. The good thing now is that there are so many other crowdfunding platforms available.</i> ⁶ (Complementor)	<i>While the average loan syndicated online by Kiva [...] is about \$415, the organization will make much larger loans in the U.S. The initial roll-out of the program has 45 entrepreneurs, seeking loans ranging from \$1,025 to \$10,000.</i> ⁷ (Industry expert)	<i>In the past I have felt positive about Steam, but these discovery changes and the recent revenue share changes that are only relevant to hugely successful games don't make me feel particularly positive about the future of selling games on Steam. In fact I'd go as far as to say I'm worried.</i> ⁸ (Complementor)
Value capture for complements is compromised	<i>The problem is that it's now more competitive than ever. For an independent developer it is getting increasingly difficult to make a living building apps.</i> ⁹ (Complementor)	<i>As an example, when my friends at Original Grain launched in early 2013, they didn't spend a dime on paid advertising and raised just shy of \$400,000. Furthermore, over 50% of the pledges to their project came directly from traffic on Kickstarter. Flashback two years later as Original Grain launched their second campaign raising \$430,000. Only around 10% of pledges came directly from traffic on Kickstarter and relatively heavy paid advertising was used.</i> ¹⁰ (Complementor)	<i>Field Partners do charge interest on the loans they receive from Kiva, but trust me, no one is getting rich here. [...] Even with the interest, many Field Partners barely make a profit.</i> ¹¹ (Platform sponsor)	<i>"Valve makes more money, the top devs make roughly the same, but an average developer makes less." Continuing his dissection, he noted that the overall number of indie releases has more than doubled since 2015, but total revenue only went up by 25 percent.</i> ¹² (Industry expert)

Note: All sources last accessed May, 2020.

¹ <https://www.imore.com/indie-developers-age-app-store>

² <http://cliqist.com/2015/04/06/kickstarter-video-games-2015-harder-succeed-ever/>

³ <https://pages.kiva.org/blog/qa-expiring-loans-credit-limits-and-the-evolution-of-kiva>

⁴ <https://www.gamesindustry.biz/articles/2017-09-15-steam-direct-fails-to-prevent-revenue-drop-for-indies>

⁵ <https://www.macrumors.com/2015/06/24/app-store-disparity-developers-gaming-websites/>

⁶ <https://www.inc.com/debbie-sterling/why-it-is-harder-than-ever-to-stand-out-on-kickstarter.html>

⁷ <https://indiamicrofinance.com/kiva-takes-a-righteous-risk-offers-peer-to-peer-lending-in-the-u-s.html>

⁸ <http://greyalien.com/blog/steams-discovery-algorithm-killed-my-sales/>

⁹ <https://alltopstartups.com/2016/03/30/do-apps-still-make-money/>

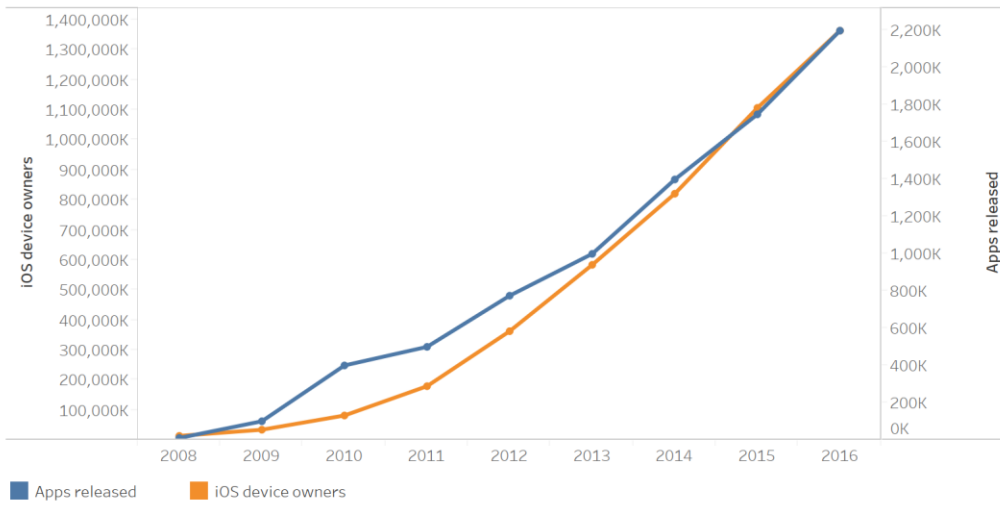
¹⁰ https://www.huffpost.com/entry/why-kickstarter-is-corrupt_b_8111662?guccounter=1

¹¹ <https://pages.kiva.org/blog/kiva-and-its-field-partners-myths-and-misconceptions>

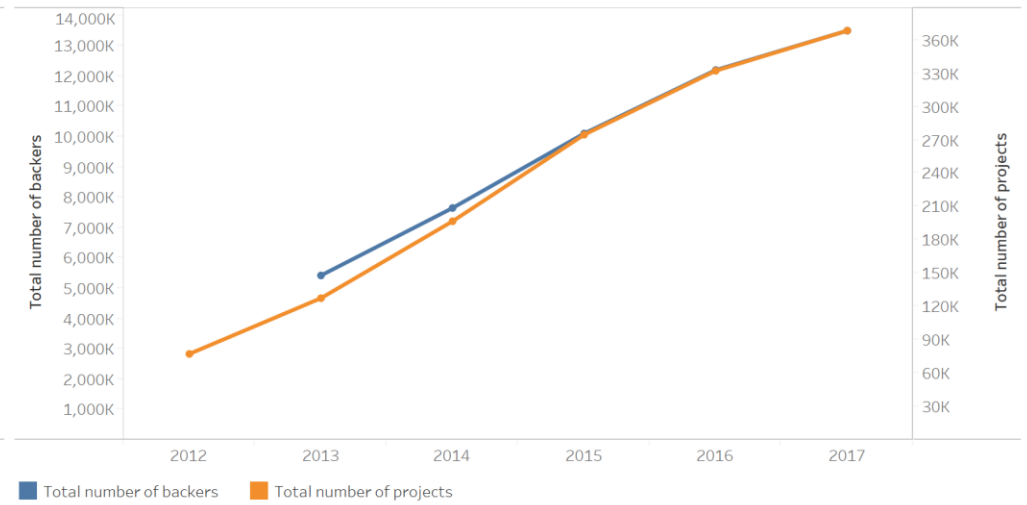
¹² https://www.gamasutra.com/view/news/305705/How_the_flood_of_Steam_games_affected_the_average_indie_dev.php

Figure I. Accumulation of End Users and Complementors by Platform and Year

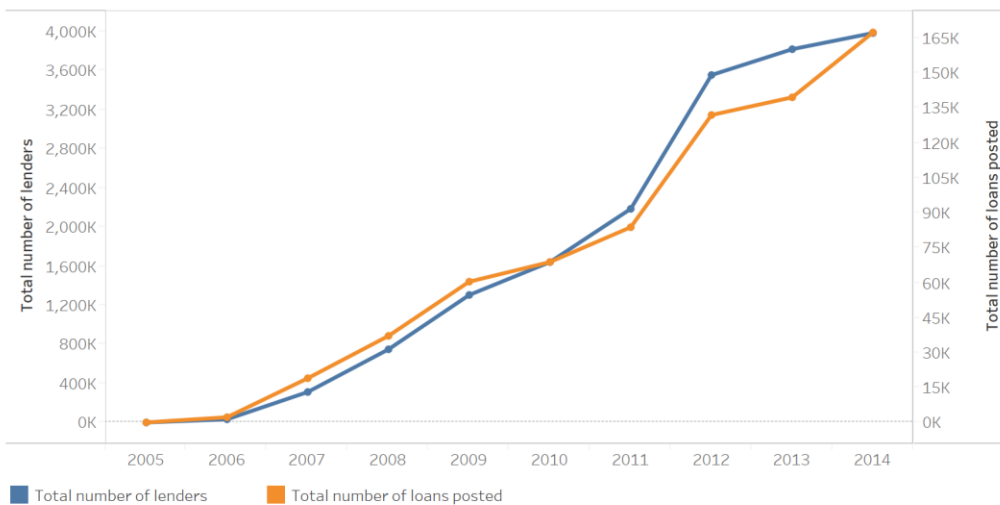
Apple's App Store: iOS device owners and apps released



Kickstarter: Backers making pledges and projects



Kiva: Lenders making loans and loans posted



Valve's Steam: Registered users and games released

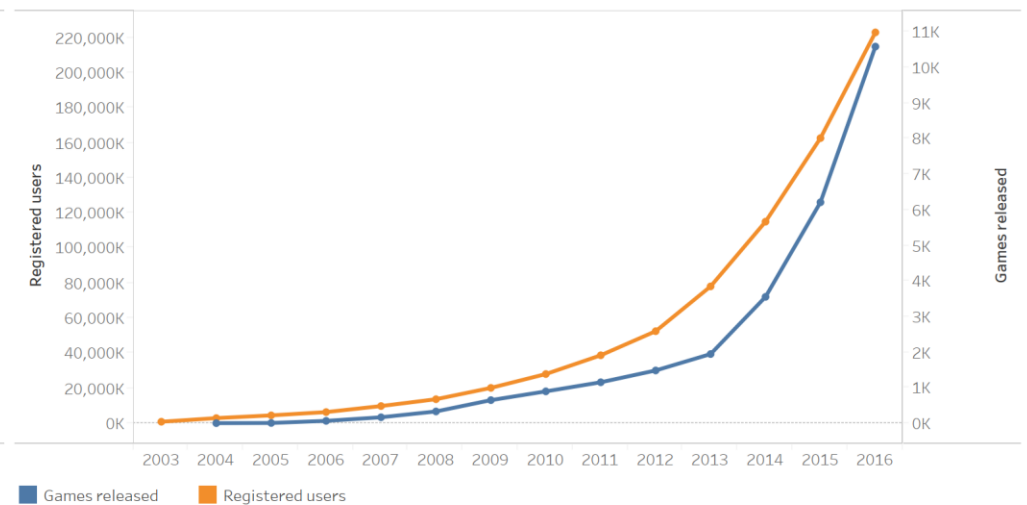


Figure 2. Coding Structure for Platform Governance Changes

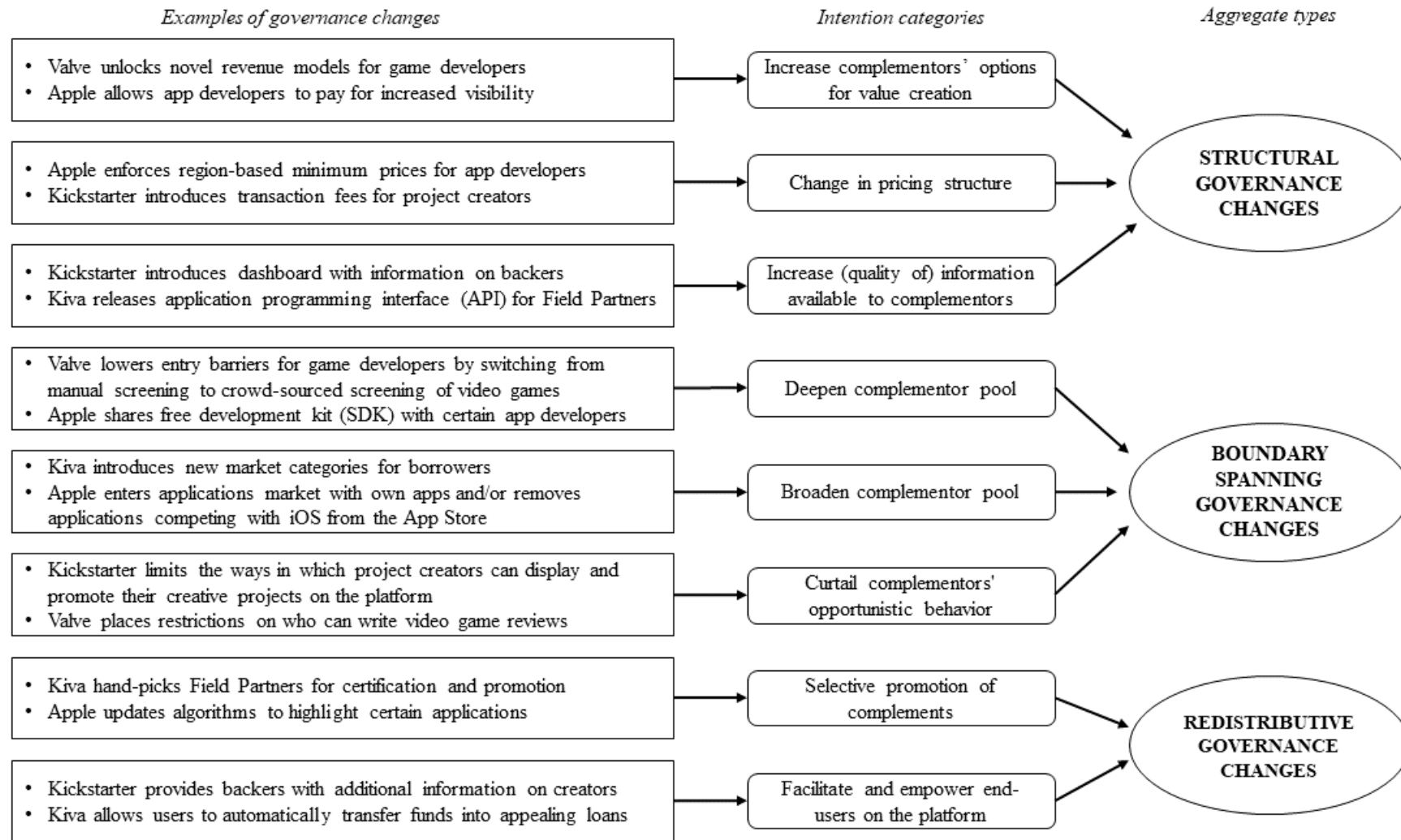
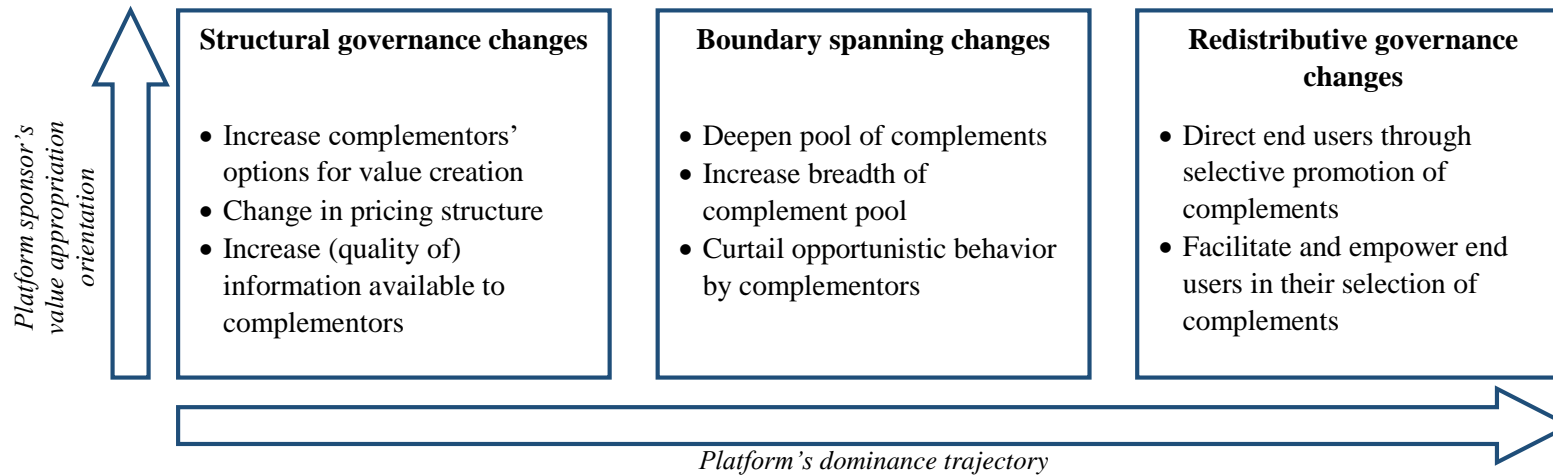


Figure 4. Governance Strategies and Platform Dominance Trajectory



Note. The horizontal arrow denotes the evolution of platform governance strategies as it is associated with a platform's increasing position of dominance. The vertical arrow reflects the extent of governance changes as a function of a platform sponsor's value appropriation orientation, such that platform sponsors with a stronger orientation on value appropriation implement more and more impactful governance changes than platforms with a public welfare orientation.

Figure 5. New Games Entering Steam Before and After the Introduction of Greenlight

Steam

New games entry before and after Greenlight

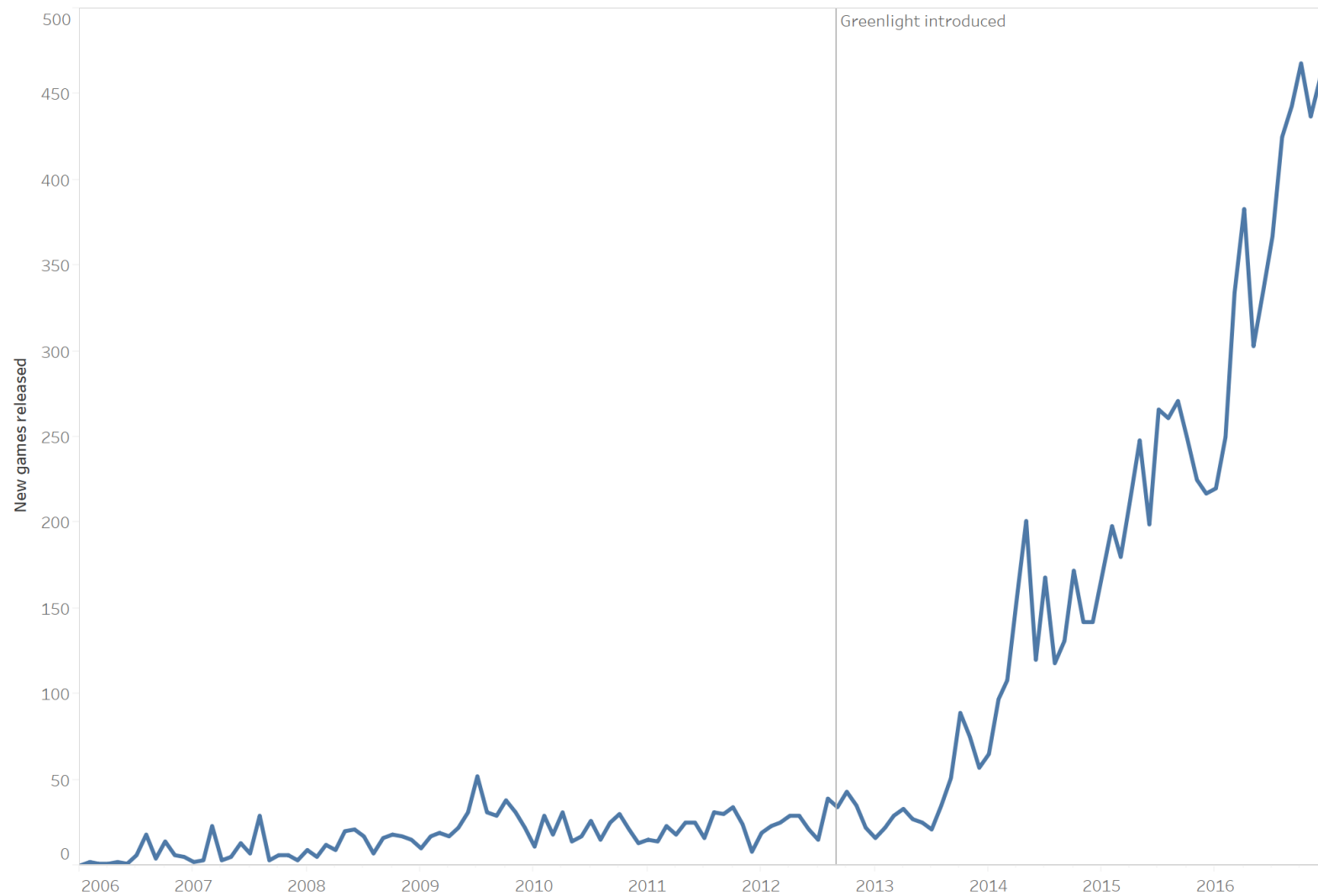
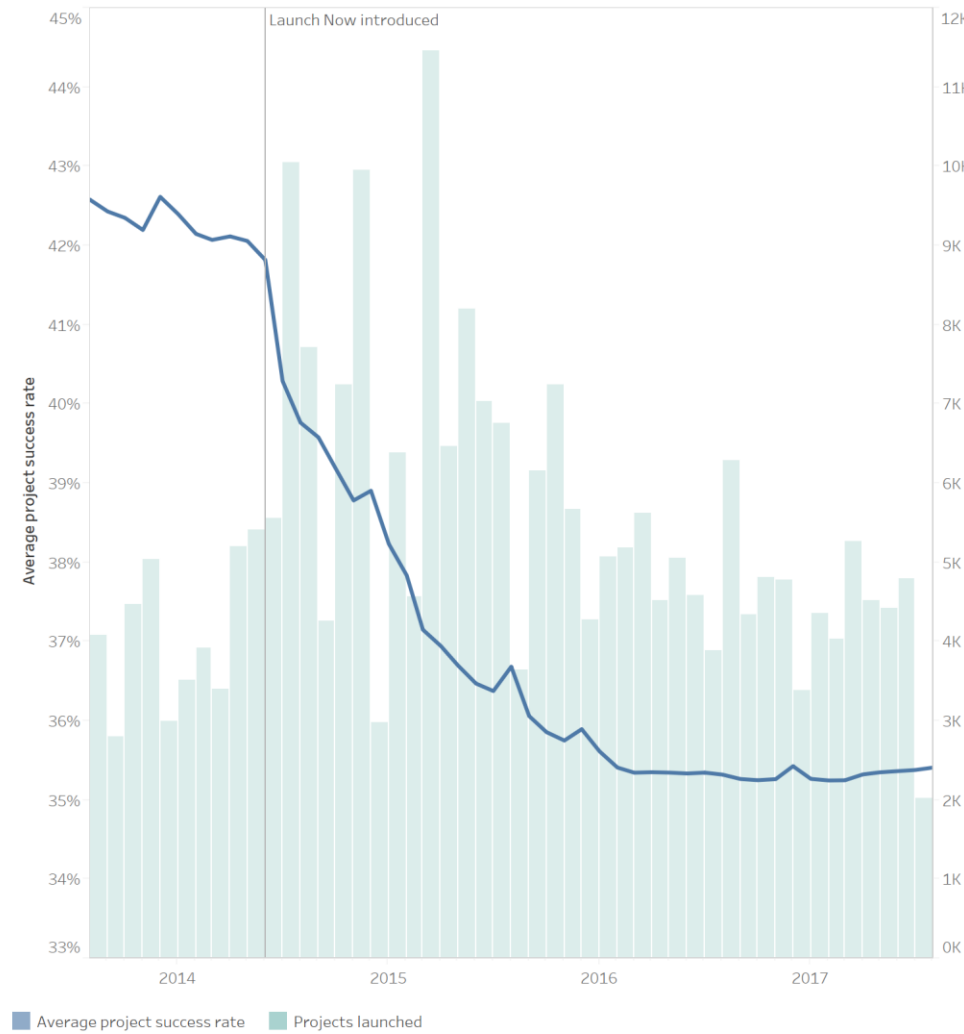


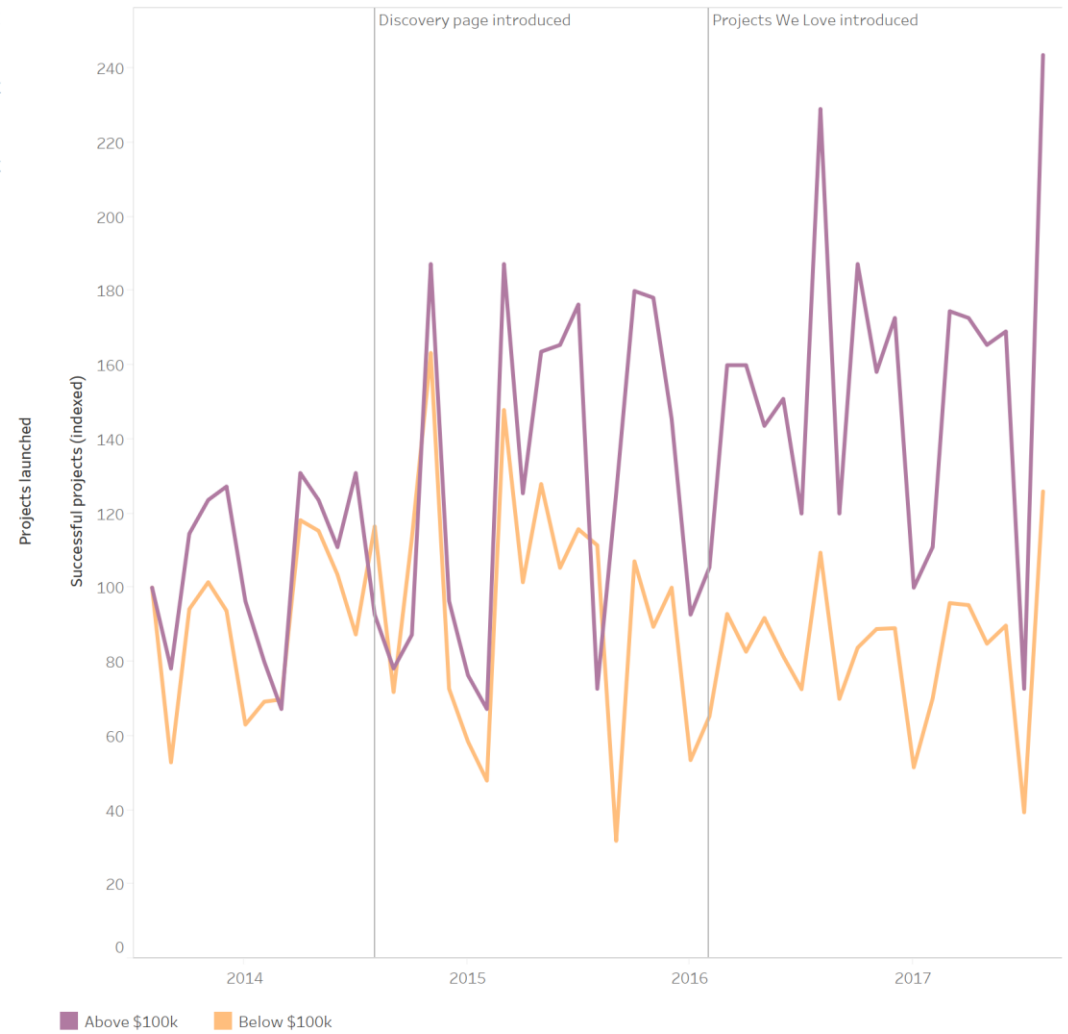
Figure 6. Monthly Average Success Rates for Kickstarter Projects, Broken out by Funding Requirements

Kickstarter

Projects' monthly entry and success rates



Successful projects above and below \$100k funding goal

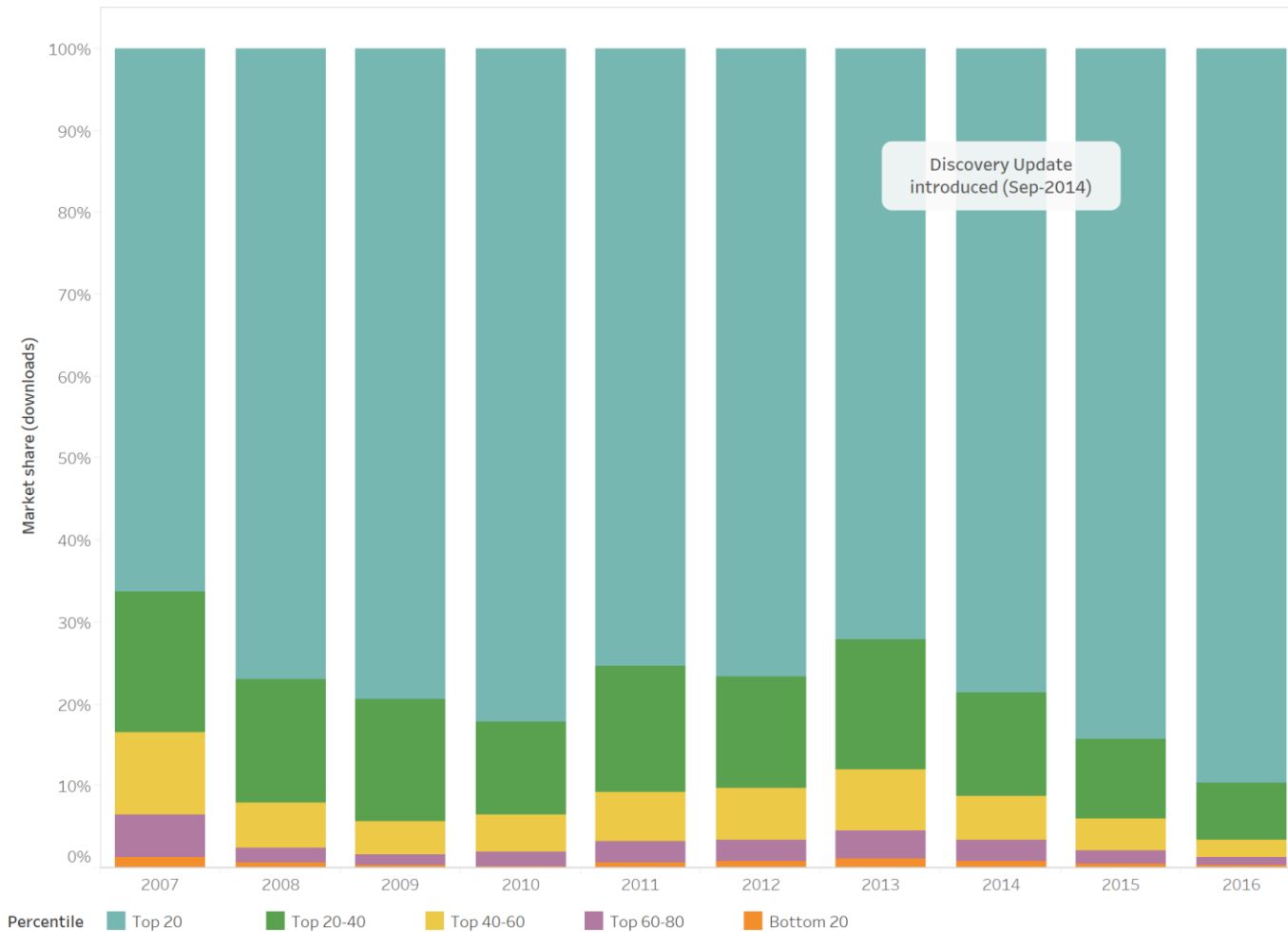


Note. The left-hand panel displays projects' monthly average success rates over the number of projects launched on Kickstarter. The right-hand panel displays the monthly number of successful projects with funding goals above and below \$100k USD (indexed on August 2012).

Figure 7. Share of Cumulative Downloads for Games on Steam, Grouped by Download Ranks

Steam

Share of cumulative downloads for game cohorts grouped by download ranks

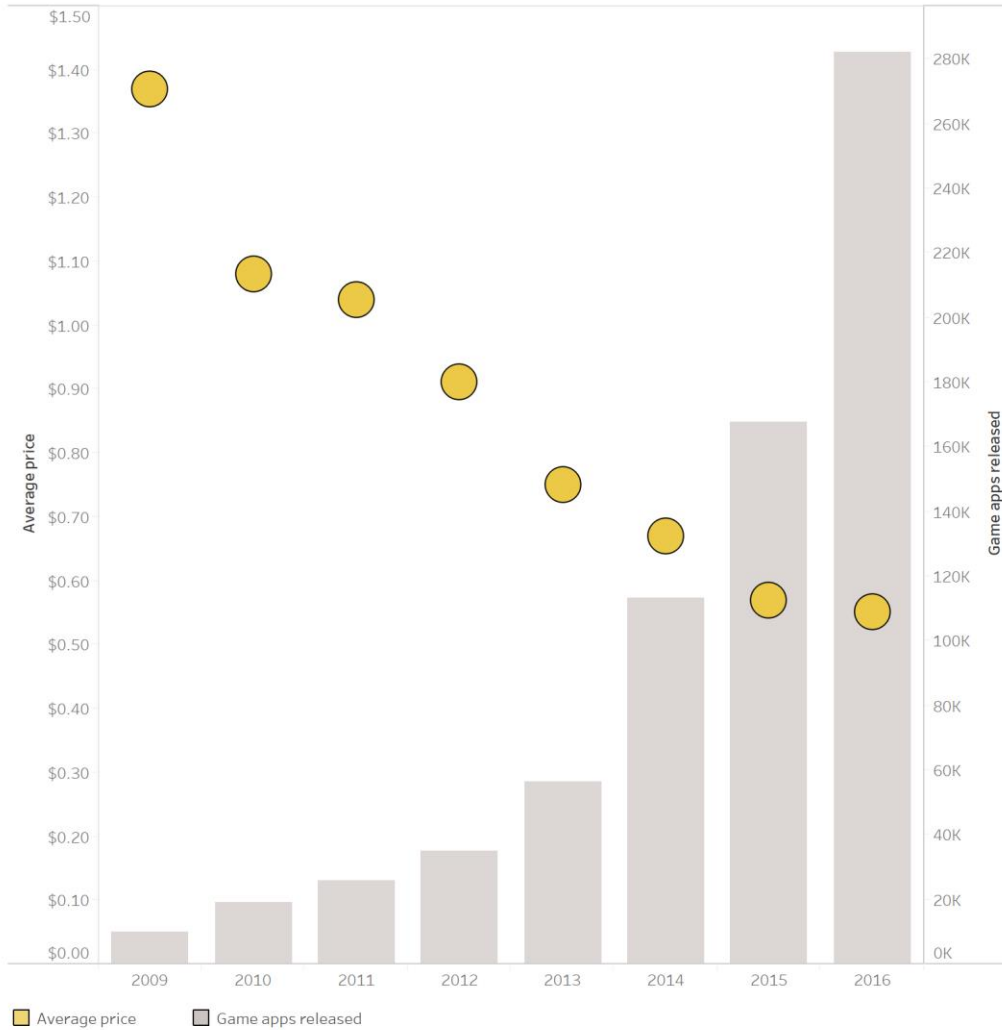


Note. Bars display the share of cumulative downloads for video games released on Steam, grouped by their relative market performance. For example, the top 20 percentile most downloaded video games released in 2016 captured just under 90% of all downloads for games released that year. Across the period on display (2007-2016), the top 20 percentile most downloaded video games on Steam accounted for 84% of all game downloads on Steam.

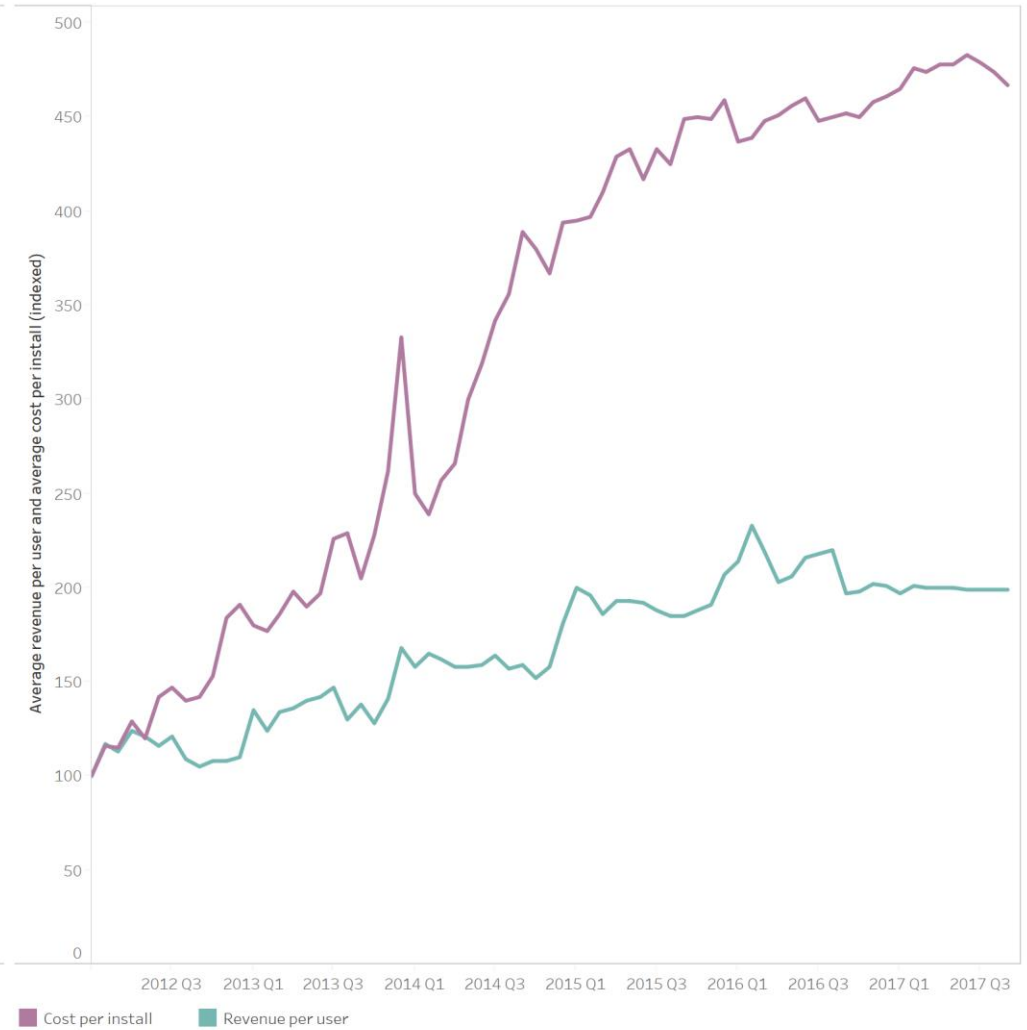
Figure 8. Prices, Costs and Revenues for Game Apps on the iOS App Store

iOS App Store

Prices and entry rates for game apps



Revenues and costs per user for game apps



Note. The left-hand panel displays the yearly average price for game apps and the number of new game apps entering the platform. The right-hand panel displays the average revenues and the average costs per user for game apps on the iOS App Store (indexed on January, 2012).