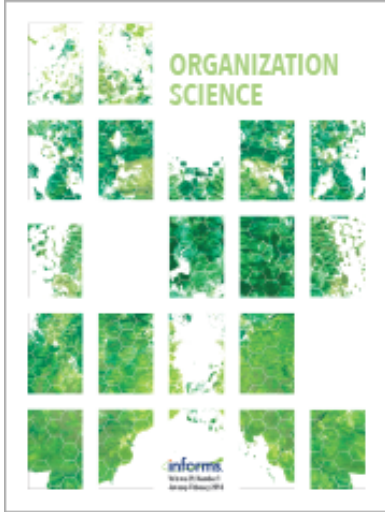




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Platform Strategy: Managing Ecosystem Value Through Selective Promotion of Complements

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Abstract. Platform sponsors typically have both incentive and opportunity to manage the overall value of their ecosystems. Through selective promotion, a platform sponsor can reward successful complements, bring attention to underappreciated complements, and influence the consumer's perception of the ecosystem's depth and breadth. It can use promotion to induce and reward loyalty of powerful complement producers, and it can time such promotion to both boost sales during slow periods and reduce competitive interactions between complements. We develop arguments about whether and when a platform sponsor will selectively promote individual complements and test these arguments on data from the console video game industry in the United Kingdom. We find that platform sponsors do not simply promote "best in class" complements; they strategically invest in complements in ways that address complex trade-offs in ecosystem value. Our arguments and results build significant new theory that helps us understand how a platform sponsor orchestrates value creation in the overall ecosystem.



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Keywords: platforms • ecosystems • complements • value creation • value capture • endorsements

Introduction

Many markets are structured as platform ecosystems, in which a stable core (such as a smartphone operating system or a music-streaming service) mediates the relationship between a wide range of complements (such as software applications or music titles) and prospective end users. When a market is composed of a platform and complements in this way, there can be a complex interplay in how each element of the bundle contributes to the overall value of the system, and there are important interdependencies between the actions of the members comprising the ecosystem (Pierce 2009, Ceccagnoli et al. 2012, Gawer 2014, McIntyre and Srinivasan 2017, Jacobides et al. 2018).

Members of a platform ecosystem often have strong vested interest in each other's fates. Because it is the overall appeal of the ecosystem that attracts end users to the platform, the success of individual members depends, at least in part, on the success of other members of the ecosystem—even those with which they may be simultaneously competing. Furthermore, in many platforms, there are switching costs that make it difficult or costly to change ecosystems. Platforms and their complements may have made investments

in cospecialization or signed exclusivity agreements that bind them into stickier, longer-term relationships than the market contracts used in typical reseller arrangements. A platform ecosystem thus is characterized by relationships that are neither as independent as arm's-length market contracts, nor as dependent as those within a hierarchical organization. It is, in essence, a hybrid organizational form.

Because a platform sponsor interacts with all the complements and with the end users, it is often in a strong position to exert governance over the ecosystem (Yoffie and Kwak 2006, Boudreau and Hagiu 2009, Adner and Kapoor 2010, Wareham et al. 2014). It possesses both incentive and ability to manage how the ecosystem creates value. Its actions influence not only the stand-alone value of its platform but also the breadth, range, and quality of the complements produced by others. It can draw attention to complements in areas in which the overall ecosystem needs bolstering, and it can influence the timing of that attention to manage the ecosystem's life cycle. Compared with a retailer that can let products compete in survival-of-the-fittest fashion and can easily adapt its product mix based on their performance, a platform sponsor is in

longer-term relationships with its complements and is thus more vested in their success over the long term. However, in its activities to influence their success, the platform sponsor must also consider the differential value that each offers to the overall ecosystem, the competitive relationships between complements, and issues relating to exclusivity agreements.

A key way a platform sponsor manages the value of its overall ecosystem is through selective promotion with which it nurtures the success of individual complements and manages end users' perception of the breadth and depth of the platform. Apple provides an apt example. By choosing applications to feature on the home screen of its iOS App Store in categories such as "Editor's Choice," "Best New Apps," and "Best New Games," it draws more attention to these complements and boosts their sales. Applications that are featured by Apple in this way may get up to six times as many downloads as other applications during the period they are featured.¹ Furthermore, by selectively targeting different types of applications, it manages end users' perceptions of the range and overall quality of the ecosystem and can help to broaden the range of applications adopted by consumers. Examples of other platforms that use selective promotion to manage their ecosystem of complements include the music-streaming service Spotify, which generates curated playlists; Kickstarter, which creates lists of "Projects We Love"; and Sony PlayStation, which endorses video games under the "Platinum" rerelease label.

Although the relationship between a platform and its complements is similar in some ways to the relationship between a reseller and the manufacturers it works with, the motives and mechanisms of selective promotion by a platform sponsor are substantially different from the reseller trade promotions studied in the marketing literature. The typical trade promotion transaction is a price cut offered by a manufacturer to a reseller to encourage the reseller to reduce the retail price ("pass through"). Occasionally such trade promotions take other forms such as bill-back allowances, advertising allowances, free goods, inventory financing, etc. (e.g., Kumar et al. 2001). One of the frequent findings in research on trade promotions is that retailers often do not fully pass the incentive on to consumers but instead capture it as profit for themselves (Lal 1990, Wellam 1998, Ailawadi and Harlam 2009, Ailawadi et al. 2009). This highlights that, in general, trade promotion is initiated and funded by the manufacturer, not the retailer. It is uncommon for a reseller to invest in promoting a manufacturer's goods unless that promotion has been funded by the manufacturer itself, and when this occurs, it is typically for high-market-share, high-margin products (Ailawadi and Harlam 2009).

Platform sponsors' incentives, by contrast, are more complex; the cospecialization that occurs between platform and complement and the need to foster a valuable and complete ecosystem motivate a platform to more actively orchestrate the attention paid to different complements.

Selective promotion can take many forms: endorsements, awards, special marketing campaigns, being featured in higher-visibility locations, and more. Selective promotion can be important in any industry, but it is a particularly interesting and important strategic lever in platform industries precisely because of the interdependence between members of the ecosystem and the governance role played by the platform sponsor (Jacobides et al. 2018). There has been considerable research on how types of awards or endorsements influence consumer perceptions and the subsequent economic value of a product or service (e.g., Friedman et al. 1976, Agrawal and Kamakura 1995, Erdogan 1999, Dean and Biswas 2001, Biswas et al. 2006). However, in a platform ecosystem, the sponsor has to *choose between* different complements to promote, many of which are competing for the attention of the same users. This is a fundamentally different question from the one historically examined in the marketing literature (i.e., does endorsement help, and which kinds help the most?).

In a platform ecosystem, the decision to selectively promote a complement confers advantage to one complement over others, and it is a more complex strategic decision than may at first be apparent. First, a platform sponsor typically cannot promote all complements because of resource constraints and the need to protect the meaning and credibility of its promotion efforts. This means it must make careful choices about which promotion efforts will have the biggest payoff in terms of value created and captured. This leads to a second complication: producers of complements are likely to be competing against each other, and the platform sponsor's investment influences the competitive dynamics between them, which, in turn, affects their incentives and their bargaining power.² A third complication is that complements create value in the ecosystem both through their individual performance and, as alluded to earlier, through their contribution to the ecosystem's overall depth and range that attracts end users to the platform. Sometimes the complement with the best individual performance is not the one that would best increase the overall appeal of the portfolio or the range of consumers the portfolio can attract. If, for example, multiple high-quality complements meet the same consumer needs, they may be redundant in terms of their contribution to the overall ecosystem. In this case, the platform sponsor might be better off rationing scarce resources in a way that meets a broader variety of needs. Finally, two complements

might be of comparable quality, but one might be exclusive to the platform, and the other is not. In general, a platform sponsor is likely to capture more of the value created by complements with which it has more favorable terms or an exclusive arrangement. Collectively, this means that complements of similar quality or performance could differ significantly in the value they offer to the platform sponsor. There is also a temporal element to a platform's governance strategies; the platform sponsor might, for example, use selective promotion to create excitement around a complement during an otherwise slow sales period or bring a complement to the attention of later adopters of the platform. These complexities raise important questions about how and when platform sponsors deploy their resources to greatest advantage: *How do platform sponsors choose the complements to promote and when to promote them?*

There has been considerable research on how a platform's features, such as price, openness, installed base, and complementor composition, affect its competitive position (Brynjolfsson and Kemerer 1996, Schilling 2003, Shankar and Bayus 2003, Clements and Ohashi 2005, Parker and Van Alstyne 2005, Boudreau 2010, Seamans and Zhu 2013, Boudreau and Jeppesen 2015).³ There also has been growing interest in the determinants of complementor success (Boudreau 2012, Yin et al. 2014, Eckhardt 2016, Kapoor and Agarwal 2017, Rietveld and Eggers 2018). However, despite a growing awareness that platform ecosystems are often managed by a single player that possesses a high degree of architectural control (Yoffie and Kwak 2006, Boudreau and Hagiu 2009, Schilling 2009, Jacobides et al. 2018), research on how platform owners deliberately orchestrate their ecosystems is relatively scant. Important exceptions include recent work by Adner and Kapoor (2010) and Wareham et al. (2014), but we still have much to learn about how platforms manage their ecosystems.

We build theoretical arguments about how platform sponsors decide which complements to selectively promote and when to promote them to increase the value of the ecosystem. We empirically test these arguments in the console video game industry using data on the decisions platforms (i.e., video game consoles) make about awarding "Best of" titles to individual video games, a practice that is referred to as *endorsement*. Video games chosen for endorsement are repackaged with the award figuring prominently and are relaunched to the market. Such selective promotion typically has a large effect on the subsequent performance of the game. Although our arguments are equally applicable to other types of selective promotion (e.g., advertising, prominently featuring or recommending complements on the platform's website, selecting complements for a bundling arrangement with the platform), "Best of" endorsements are the primary

means by which platforms selectively promote complements in the console video game industry. Furthermore, because they are visible, easily measured, and of high impact, they provide an excellent context for our study. We show that selective promotion is a complex strategic decision: although platform sponsors seek both depth and breadth of complements to attract and satisfy end users, quality concerns, exclusivity, and timing issues create strategic trade-offs that the platform sponsor must take into consideration in determining whether and when to promote individual complements.

Using Selective Promotion to Manage Ecosystem Value

A platform sponsor wishes to increase the overall value of its ecosystem and its ability to extract value from the ecosystem. Increasing the overall value of its ecosystem enhances its direct profitability because the platform sponsor typically captures a share of the value created by each member of the ecosystem in addition to the value it creates through sales of its own platform and its own complements. For example, Sony sells its PlayStation video game consoles at a loss while profiting from the royalty payments it receives from third-party game developers as well as from the sales of its own video games.

The factors that have the greatest influence on the value of the overall ecosystem are (1) consumers' perception of the quality and installed base of the platform itself, (2) consumers' perception of the quality of individual complementary goods, which is, in part, a result of their interaction with the quality of the platform, and (3) the depth and breadth of the complements in the ecosystem [for a more detailed discussion, see Schilling (1998, 2003)]. We focus on the latter two here: how platform sponsors can influence consumers' perception of the quality, depth, and breadth of complements. By promoting a particular complement, the platform helps to direct end users' attention to it, increasing its visibility and saliency and providing information that serves as a signal of the complement's quality. When there are a large number of complements competing for consumers' attention, even high-quality complements may go undiscovered. In such cases, selective promotion can significantly increase awareness for such complements. Promoting a complement is, as we discuss, a powerful way to signal consumers about the quality of the complement and help consumers sort between competing complements.

Selecting Complements for Promotion

Complements enhance the value of the overall ecosystem both when they have high quality on a stand-alone basis and when they collectively offer better depth

and breadth of complement selection to the end users of a platform. We examine how each of these factors drives the platform sponsor's decision about whether and when to selectively promote a complement.

High-Quality Complements with Unrealized Potential. It should be clear that the platform sponsor is more likely to promote complements that have exceptional quality and strong sales performance. Exceptional complementary goods can have a disproportionate influence on platform adoption by consumers (Binken and Stremersch 2009, Gretz and Basuroy 2013, Lee 2013). Many video game console consumers, for example, choose their console based on the availability of one or a few highly desired games. Similarly, it is well understood that a “killer app” can make or break a computing or smartphone platform. The platform sponsor thus wishes to bring complements with killer app potential to the attention of consumers. Furthermore, because consumers may perceive promotion by the platform as a signal of quality, the platform owner must be careful to avoid promoting complements of low quality because it would violate the trust between the platform and the consumer and would erode the user's faith in the platform. If a complement already has high quality and mass market appeal, using promotion, such as awarding a “Best of” title or preferred display location, can help consumers identify that complement and result in a much greater sales increase (in absolute terms) than promoting a weak complement. Complement quality is thus an important baseline control in our models.

However, although it is easy to assume that a platform simply promotes the best-selling complements, this is often not its best strategy for increasing the value of the overall ecosystem: the platform needs to take into account the opportunity for additional value creation in the form of a sales increase for the complement. The marginal value of privileged access or selective promotion by the platform is not a linear function of the complement's quality and prior sales performance: it is likely that, at some point, diminishing returns set in; that is, the amount of improvement in either sales or visibility available to an already exceptional complement may be limited (e.g., Adner and Zemsky 2006). The platform sponsor's ability to increase the value of a complement through selective promotion may be greater for complements whose full value has not yet been recognized—the “up and coming” complements. These complements may have more untapped value to be harvested than a well-known complement.⁴ We thus argue that, controlling for quality, platforms are likely to promote complements that have good initial sales performance but are not yet the very best sales performers on the platform.⁵

Hypothesis 1. *Platform sponsors are more likely to promote complements that have demonstrated good, but not best, initial sales performance than either complements that have demonstrated the very highest sales performance or poor sales performance.*

Complements That Round Out the Ecosystem. Next, because platforms need to manage the collective value creation of the ecosystem, they are influenced by the contribution individual complements make to the overall ecosystem breadth (such as the number of product categories in the ecosystem) and depth (such as the number of high-quality complements in a product category in the ecosystem). The depth and breadth of an ecosystem are often important both in an individual consumer's adoption decision (i.e., when consumers seek a variety of complements) and for reaching different segments of the market that have heterogeneous preferences (Gupta et al. 1999, Rietveld and Eggers 2018). As told to us in an interview with a senior executive at Microsoft who was part of the original Xbox founding team, “We have a portfolio team, and we look at how the games round out the portfolio and sell the console . . . you want to make sure the portfolio is well rounded. We have racing games, shooter games, fan favorites, and so forth. We have to decide which games to shine that limelight on.”

Platforms often emphasize different categories of complements based on their intended positioning. Xbox, for example, emphasizes games targeted at hard-core gamers, and the games emphasized by Nintendo are often more family friendly and targeted at light, or casual, gamers. Similarly, the iPhone App Store has significantly more focus on music applications than the Android App Store because the iPod and iTunes are part of its core function and identity. However, even given these different positionings, platforms need to ensure that their ecosystem meets the range of needs of their target market. The depth and breadth of the portfolio of complements for a platform also send a powerful signal to the market about the platform's current and future success. Each complement developed for a platform is evidence that the complement producer believes the platform is likely to be successful.

This suggests that platform sponsors are inclined to spread their promotion efforts over important categories rather than choosing complements to promote purely on the basis of their stand-alone performance. If a platform does not have a high-selling complement in an important product category on the platform, we argue, the platform sponsor is much more likely to selectively promote complements in that category to raise end users' perceptions of the quality of the platform's complements in that category and, therefore, the breadth of the overall ecosystem.⁶

Hypothesis 2. *Platform sponsors are more likely to promote complements in high-value categories in which the platform does not have a top-selling complement than either high-value categories in which the platform already has a top-selling complement or low-value categories.*

Complements That Are Exclusive to the Platform.

Platform sponsors prefer to invest in enhancing the reputation of high-quality complements that are exclusive both because it rewards their loyalty and because they prefer not to promote a product that customers may buy for a competing platform. Complements can be exclusive to a platform for multiple reasons. First, complements produced by the platform sponsor (*first-party complements*) are exclusive by default. Second, significant investments in cospecialization required between the platform and the complement may make it costly for a complement to work with multiple platforms (Anderson et al. 2013, Cennamo et al. 2018). Third, platforms sometimes demand exclusivity agreements or may factor exclusivity into their deal terms with complement producers (Johns 2006). Fourth, a complement could be exclusive because it has not proven to be high quality or popular and is not sought by other platforms. Thus it is important to note that the platform sponsor only wishes to promote *high-quality*, exclusive complements; it does not seek to promote complements that are only exclusive because they are of low quality or not desired on other platforms. Having an exclusive arrangement with an exceptional complement helps to differentiate the platform; having an exclusive arrangement with a poor complement does not. We thus expect the interaction of complement quality and complement exclusivity to increase the chances of selective promotion by the platform over and above the effect of quality or exclusivity alone. That is, we expect a positive main effect for quality (baseline hypothesis) and a positive interaction between high quality and exclusivity, and we have no expectations regarding a main effect for exclusivity.

Hypothesis 3. *Platform sponsors are more likely to promote complements that are both high quality and exclusive than complements that meet one or none of those criteria.*

The Timing of Selective Promotion

The platform must manage the value it creates and captures from its overall ecosystem throughout its entire life cycle and thus must take timing effects into account. Similar to the way that the platform uses promotion to manage the consumer's perception of the ecosystem's breadth (as articulated in Hypothesis 2), it also uses promotion to manage consumers' perceptions of the ecosystem over time. The platform sponsor thus is likely to use endorsements to generate

new "buzz" about the platform and its complements during periods when attention has waned, thereby reinvigorating sales. By promoting complements during a period when fewer complements are being released, the platform avoids competitive crowding, lessens cannibalization of newly released complements (Boudreau 2012), and increases the impact of the promotion; the signal provided by the promotion is likely to stand out more clearly in a market that is not currently awash with promotional media about new complements entering the market.

Cash-flow smoothing and avoiding competitive crowding are both evident in the following quotes we obtained during an interview with a director of sales planning and analysis at Sony PlayStation: "You don't want all of your good stuff to come out at the same time . . . it's all about managing the catalog. If the calendar is looking empty, we will rerelease to fill the catalog. Contrarily, during Christmas, we won't rerelease." We thus predict that platform sponsors promote more complements during periods when there are fewer new complements being released.

Hypothesis 4. *Platform sponsors promote more complements in periods when there are fewer new complements being released.*

In each of these hypotheses, it should be clear that the platform wishes to maximize the value it creates and captures from its promotions and that the platform manages for the overall success of its ecosystem, including over its life cycle. The platform is constrained in how many complements it can promote, and it thus wishes to maximize the marginal effect of each promotion for the entire ecosystem. The platform thus does not just promote the "best" complements as if these are independent decisions; instead, the promotions are instruments whose effects and timing must be carefully orchestrated.

Empirical Setting: Platform-Endorsed Console Video Games

We test our hypotheses in the context of home video game consoles. Video game consoles are often studied in the platform competition literature given their canonical features as a platform ecosystem (e.g., Clements and Ohashi 2005, Cennamo and Santalo 2013). Platform sponsors such as Sony and Microsoft invest heavily in designing technologically superior platforms that are released to the market approximately every seven years. To quickly ramp up adoption by consumers, platform sponsors generally price their consoles at or below cost. Console makers capture value from selling their own, internally developed video games and from the royalties paid by third-party video game publishers, such as Electronic Arts, Activision, and Ubisoft. A key strategy that

console manufacturers deploy to govern their platforms is selectively issuing endorsements to promote individual video game titles.

A small portion (~10%) of all video games is picked by the platform sponsor to be rereleased with a “Best of” endorsement. Sony, for example, endorses games under the “Platinum: The Best of PlayStation” label. It describes this endorsement with the following: “Games that warrant a Platinum release are the cream of the crop, the very best games that have been published. . . . They’re often titles that are innovative in their design and feel, offer immersive gameplay, wowed game critics, and received their fair share of accolades and awards.”⁷ Similarly, Microsoft endorses games under the “Xbox Classics” label. Platform sponsors select games for endorsement only after they have been on the market for some time and have surpassed certain sales and engagement thresholds. As described by a senior Xbox team member, “When a game comes out, you don’t know what’s going to be a hit and what isn’t. You want to have more than a year under your belt because you want to have a nice snapshot. You want sales numbers, fan reviews, downloads . . . you want a complete story. That story takes a little while to reveal itself.” Although the exact details of the requirements are kept confidential and vary across countries, industry informants tell us that to be eligible for an endorsement in the United Kingdom (our empirical context), a video game must have sold a minimum of 300,000 units in the wider European market and must also have been on the market for at least 180 days. A former senior executive at Microsoft’s Xbox group told us that the endorsement decision takes place at the highest levels of the organization (e.g., senior vice president and above). When there are disagreements about which games to endorse, the decision is escalated to even more senior personnel, such as to a senior director. Although a game’s publisher has some agency with regard to the endorsement of a specific game it published, the platform sponsor ultimately decides *which* games are eligible for endorsement and also determines *when* endorsed games get released.

Platform-endorsed video games are rereleased to the market with distinct packaging clearly marking the endorsement (see Appendix A for examples). Endorsed rereleases are often accompanied by a small drop in retail selling price (see Appendix B). Although the licensing contract between the publisher and the platform remains largely intact, platform sponsors do charge publishers a lower royalty payment for endorsed rereleases to offset this drop in selling price. This was confirmed by a director of sales planning and analysis at Sony PlayStation: “We charge them less to create the disc for Platinum games, so third parties’ margin is less squeezed by the

cheaper price point.” A game’s playable content, technical design, and other important details remain otherwise unchanged. In Appendix B, we exploit data on games’ weekly unit sales to confirm that platform endorsements do indeed boost video games’ sales performance compared with otherwise identical non-endorsed video games.

Data: Seventh-Generation Console Video Games in the United Kingdom

We collected longitudinal data on all games launched on seventh-generation video game consoles in the United Kingdom between 2007 and 2011. In our analyses, we particularly focus on video games released on Sony’s PlayStation 3 (launched in March 2007) and Microsoft’s Xbox 360 (launched in December 2005). The seventh generation is ideal for our study because both Sony and Microsoft were already established in the video game industry (Microsoft was a new entrant in the sixth generation), and the two companies competed directly against each other for both consumers and game developer support.⁸ We chose the UK market as our research site because the United Kingdom was the biggest country-market for video game software within Europe and the third biggest market worldwide during our study time frame (International Development Group 2011). Moreover, although Platinum and Classics rereleases are common in all three supranational markets for video game consoles (i.e., North America, Europe, and Asia; see Johns 2006), they are of greatest relevance and account for a disproportionate share of the total video game sales in the European market.

Data at the platform and at the game level were provided by one of the platform sponsors and are comprehensive in that they include more than 90% of all retail transactions (including online and brick-and-mortar retail transactions) for all games released in the United Kingdom. We complemented these data with hand-collected data on expert review scores from the review aggregation website Metacritic.com. At the time of data collection, Metacritic tracked more than 300 online and off-line trade publications whose evaluations it aggregated and transformed into a weighted average “Metascore” ranging from 0 to 100 at the game-platform level. Because platform sponsors only endorse video games after they have met a certain sales threshold in the wider European market, we collected additional sales data at the European level. European sales data were collected from the online sales-tracking database VGChartz.com and are expressed in millions of units. To allow for a minimum life cycle of one year to accumulate sales and become eligible for endorsement, we excluded games from our analysis that were released in 2011. We further excluded 91 games that were published by the platform sponsors because these games are exclusive by

default, and platform sponsors possibly deploy a different set of rules when it comes to endorsing their own products.⁹ Our sample for analysis includes 419 PlayStation 3 and 499 Xbox 360 games, of which 47 PlayStation 3 and 58 Xbox 360 games received an endorsement. On average, platform-endorsed rereleases are launched onto the market one year and two months after a video game's initial release.

Variable Definitions

Dependent Variable. Our hypotheses pertain to console makers' strategic selection of video games for endorsement. *Endorsed* is a dummy variable that takes the value of 1 when a video game is endorsed and rereleased through a platform sponsor's selective promotion. The moment of endorsement and a game's rerelease coincide; in our sample, all endorsed games are rereleased, and only the games that are endorsed are rereleased. The unit of analysis for this measure is the game-platform level.

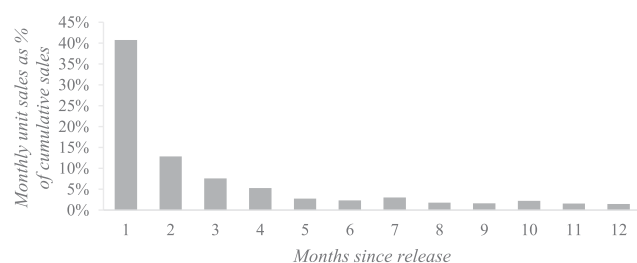
Independent Variables. Hypothesis 1 tests the effect of video games' initial sales performance on the probability of being endorsed. To test for this relationship, we look at games' first-month unit sales and take the percentage rank at the platform-year level. We use video games' first-month unit sales for two reasons. First, as depicted in Figure 1, first-month unit sales account for a disproportionate share (>40%) of games' cumulative unit sales and thus are strongly indicative of overall market performance (Nair 2007, Rietveld and Eggers 2018). Second, to prevent concerns of reverse causality, we take a relatively narrow approach to avoid including any sales that may occur after the decision to issue a platform endorsement has been made. To distinguish between market-leading games, games with good (but not market-leading) sales, and games with sales below these thresholds, we break up the sales rank measure into three dummy variables: *top 2.5% sales rank* (i.e., market-leading sales), *top 2.6%–20% sales rank* (i.e., good initial sales), and *bottom 80% sales rank* (poor initial sales, the base category). We chose the 20% cutoff point because the market for console video games exhibits the Pareto principle that 80% of

the sales come from 20% of the products. We then chose the 2.5% cutoff because it is restrictive enough to ensure that we are looking at the very top video games yet large enough to still include a sufficient number of observations and variance for robust analysis. For Hypothesis 1 to hold, games with the top 2.6%–20% sales rank should have a positive effect on the probability of receiving an endorsement, and the coefficient has to be significantly higher than for games with market-leading sales (*top 2.5% sales rank*) and games with poor sales performance (*bottom 80% sales rank*). Our reported results are robust to alternative specifications, such as using the top 1% as a cutoff point for best-selling games.

To test whether platform sponsors are more likely to endorse video games in high-value genres in which the platform lacks a recent top-selling video game, we construct two variables that are then interacted. The first is a variable that captures whether there has been no prior hit at the platform-genre-year level. *No prior hit in genre* is a dummy that takes the value of 1 if there is no top 20% ranked video game measured by first-month unit sales in the same genre and platform of a game under consideration measured over a one-year rolling window prior to a game's release. We then create a measure of *value of genre* by taking the percentage rank of all genres by total unit sales for each year and platform. To do this, all genres are first rank ordered by the sum of first-month unit sales of all games released in that genre, in that year, on that platform. To avoid concerns of simultaneity, we calculate this measure separately for each game, and we exclude the focal video game from our measurements. The percentage of genres with lower sales than a given genre is its percentage rank such that if a genre has higher first-month unit sales than 90% of the other genres that year, its percentage rank value would be 90%. Higher percentage ranks thus reflect more valuable genres. Although our results are robust to using genres' untransformed value as measured by the cumulative first-month unit sales, the percentage rank transformation helps us account for the fact that what constitutes a high-value genre early in a platform's life cycle might not be the same as what constitutes a high-value genre later in a platform's life cycle as more games and consumers enter the platform over time. Moreover, we use a within-platform measure rather than a between-platform measure because different platforms are popular for different genres. If Hypothesis 2 is correct, we would expect a positive coefficient on the interaction between these two variables.

To test whether a high-quality exclusive game is more likely to receive an endorsement than a high-quality multihomed game, we first look at the population of video game releases and count the

Figure 1. Distribution of Games' Average Unit Sales by Months from Release



number of platforms on which a game is released. *Platform exclusive* is a dummy variable that takes the value of 1 if a game is launched only on the focal platform.¹⁰ We then interact this variable with the *high quality* variable (explained in more detail later) and expect a positive coefficient for Hypothesis 3 to be supported. Moreover, the coefficient has to be significantly more positive than that of *high quality* alone.

To measure the effects of the temporal dynamics on platforms' decisions to issue endorsed rereleases, we count the number of endorsed video games that are released on a platform at the platform-genre-month level. We expect the count of endorsed rereleases to be higher during months when there are fewer new games being released while controlling for confounding factors such as seasonality, genre popularity, and stage of the platform life cycle (Kapoor and Agarwal 2017, Rietveld and Eggers 2018). We test Hypothesis 4 by counting the number of new games that are released within a particular genre per month and expect a negative coefficient for this hypothesis to be supported.

Control Variables. As noted earlier, our baseline assumption is that a game's quality has a strong influence on receiving an endorsement. We use Metacritic's reported Metascores to check for this. Many video game publishers use Metascores as a proxy for quality, as is reflected by their contracts with game developers. Furthermore, the vast majority of the expert reviews on which Metascores are based are published prior to a game's release, reducing concerns of reverse causality. Metacritic produces a numerical score ranging from 0 to 100 that is then color-coded into ranges; scores of 75 and higher are green and include those rated as "generally favorable" (scores of 75–89) and "universal acclaim" (scores of 90–100). We identify a *high quality* video game with a dummy that indicates whether it has a Metascore of 75 or higher.¹¹ We also run robustness checks using the continuous Metascore, and our reported results are robust to either specification. Given that platform sponsors in the United Kingdom will only endorse video games that exceed a certain sales threshold in the wider European market, we add games' *European unit sales* (in millions) as a control. Notably, including this measure could dampen our ability to pick up the UK sales-rank effects, making our tests more conservative. We log-transform this measure to account for its skewness. We further control for the platform on which a game is released, its genre, and its month and year of release. First, by including platform dummies, we account for any variation in endorsement policies between the platforms in our sample. Second, because platforms may systematically be more likely to endorse games in

certain categories, we include genre fixed effects. There are 15 predetermined (by the data source) genres in our data set such as *action*, *music*, *sports*, and *war*. Third, because demand and supply of video games vary throughout the year, we control for seasonality by including *calendar-month-of-release* dummies. We also account for macro trends by controlling for the year in which a game is released by including *year-of-release* dummies. At the firm level, we proxy for a publisher's overall relationship with a platform sponsor by counting the number of games in a publisher's portfolio that were chosen for selective promotion during a period of five years leading up to a game's release. We further control for a publisher's age (in years) and whether it is listed on a major stock exchange as proxies for size and control over resources such as intellectual properties and marketing budget.¹² We log-transform the *number of past endorsements* and *publisher age* to account for their skewness.

Results

We estimate video games' probability of being endorsed with the following logit specification:

$$P(y_{ij} = 1 | X_{ij}) = \frac{\exp(X'_{ij}\beta)}{1 + \exp(X'_{ij}\beta)}$$

where $y_{ij} = 1$ equals the probability that game i released on platform j receives an endorsement, X_{ij} is a vector of variables at the game-platform level, and β is the vector of coefficients to be estimated. Table 1 reports summary statistics and pairwise correlations for the variables in our sample. Table 2 reports our main results estimated via maximum likelihood estimation by first reporting the effects of the control variables in Model 1. We then sequentially add our independent variables testing for Hypotheses 1–3 in Models 2–4. Model 5 includes all coefficients and is the model we rely on for the interpretation of our results as well as for effect sizes. Because results from nonlinear models cannot be interpreted in a simplistic manner (Hoetker 2007), we further report predicted probabilities as well as marginal effects (i.e., the estimated difference in predicted probabilities between two variables held at different values). Furthermore, because statistical significance for interactions in nonlinear models cannot be assessed by examining only the sign and statistical significance of the interaction coefficient (Wiersema and Bowen 2009, Zelner 2009), we plot predicted probabilities of the interaction effects for Hypotheses 2 and 3 in Figures 2 and 3, respectively. We estimate robust standard errors and report McFadden's adjusted R^2 as measure of model fit.

Table 1. Descriptive Statistics and Pairwise Correlations for Hypotheses 1–3

Variable	Mean	Standard deviation	Minimum	Maximum	1	2	3	4	5	6	7	8	9	10
1. <i>Endorsed</i>	0.11	0.32	0.00	1.00										
2. <i>Top 2.5% sales rank</i>	0.02	0.15	0.00	1.00	0.25									
3. <i>Top 2.6%–20% sales rank</i>	0.16	0.36	0.00	1.00	0.44	–0.07								
4. <i>Value of genre</i>	0.50	0.29	0.00	1.00	–0.03	–0.01	0.00							
5. <i>No prior hit in genre</i>	0.19	0.39	0.00	1.00	–0.07	–0.08	–0.06	–0.46						
6. <i>Platform exclusive</i>	0.12	0.32	0.00	1.00	–0.08	–0.06	–0.10	–0.07	0.12					
7. <i>High quality</i>	0.46	0.50	0.00	1.00	0.34	0.21	0.31	–0.13	0.00	–0.08				
8. <i>ln(European unit sales)</i>	0.20	0.25	0.00	1.69	0.51	0.63	0.45	–0.05	–0.10	–0.15	0.51			
9. <i>ln(Number of past endorsements)</i>	1.82	1.17	0.00	4.08	0.11	0.10	0.12	–0.08	0.09	–0.24	0.24	0.21		
10. <i>ln(Publisher age)</i>	3.16	0.61	0.00	4.25	0.05	0.01	0.03	0.11	–0.02	–0.12	0.05	0.11	0.35	
11. <i>Publisher is listed</i>	0.87	0.34	0.00	1.00	0.01	0.06	–0.01	0.05	0.05	–0.06	0.12	0.07	0.35	0.29

Notes. Based on estimation sample of 918 video games. Pairwise correlations greater than $|0.06|$ are significant at $p < 0.05$. Mean variance inflation factor (VIF) = 3.38.

Results for Which Games Platforms Choose to Endorse

In support of Hypothesis 1, we find that, after controlling for quality and other controls, games in the *top 2.6%–20% sales rank* category are more likely to be endorsed than games in the *bottom 80% sales rank* category ($p < 0.01$) and more than games in the *top 2.5% sales rank* category ($p < 0.01$). The average predicted probability of endorsement for games in the *top 2.6%–20% sales rank* category is 12.85% higher than for games in the *top 2.5% sales rank* category ($p < 0.01$) and 15.75% higher than for games in the *bottom 80% sales rank* category ($p < 0.01$). Support for Hypothesis 1 is corroborated by the finding that, of all games that receive endorsement, those with lower prior sales

performance enjoy three times higher sales increases from endorsement than those with higher prior sales performance (see Appendix B).

We also note strong support for Hypothesis 2 because the interaction between *value of genre* and *no prior hit in genre* is positive and significant ($p < 0.01$). Indeed, although the average predicted probabilities plotted in Figure 2 suggest that the probability of being endorsed does not vary much for video games in genres with prior hits, the predicted probability of endorsement for games in genres without prior hits, by contrast, changes noticeably as the value of the genre increases. For example, games in low-value genres (*value of genre* = 0.20 or one standard deviation below the mean) without any prior hits have

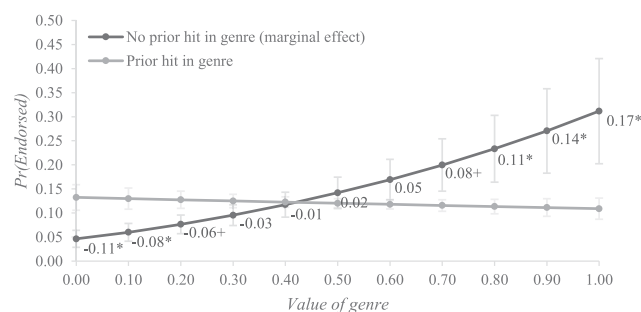
Table 2. Logit Regressions of Games' Probability of Receiving an Endorsement (Hypotheses 1–3)

Variable	Endorsed				
	1	2	3	4	5
<i>Top 2.5% sales rank</i>		–0.63 (0.88)	–0.78 (0.87)	–0.60 (0.89)	–0.76 (0.90)
<i>Top 2.6%–20% sales rank</i>		1.82** (0.38)	1.79** (0.38)	1.81** (0.37)	1.78** (0.38)
<i>Value of genre × no prior hit in genre</i>			3.77** (1.30)		4.24** (1.39)
<i>Platform exclusive × high quality</i>				13.38** (0.79)	13.41** (0.87)
<i>Value of genre</i>	0.55 (0.57)	0.19 (0.68)	–0.33 (0.73)	0.15 (0.68)	–0.38 (0.73)
<i>No prior hit in genre</i>	–0.37 (0.55)	–0.65 (0.49)	–1.70* (0.71)	–0.65 (0.49)	–1.78* (0.70)
<i>Platform exclusive</i>	–0.31 (0.57)	–0.08 (0.61)	–0.15 (0.64)	–13.13** (0.45)	–13.16** (0.56)
<i>High quality</i>	1.01** (0.33)	0.96** (0.37)	0.91* (0.37)	0.88* (0.37)	0.81* (0.37)
<i>ln(European unit sales)</i>	4.84** (0.68)	4.39** (0.80)	4.54** (0.82)	4.37** (0.80)	4.55** (0.83)
<i>ln(Number of past endorsements)</i>	0.30* (0.15)	0.25+ (0.15)	0.31* (0.15)	0.24 (0.15)	0.31* (0.16)
<i>ln(Publisher age)</i>	0.48+ (0.28)	0.62 (0.40)	0.62 (0.40)	0.60 (0.40)	0.58 (0.40)
<i>Publisher is listed</i>	–0.86* (0.40)	–0.72 (0.47)	–0.84+ (0.48)	–0.71 (0.47)	–0.84+ (0.48)
<i>Constant</i>	–7.43** (1.53)	–8.36** (2.01)	–8.18** (2.02)	–8.19** (1.99)	–7.98** (1.99)
Platform dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Calendar month dummies	Yes	Yes	Yes	Yes	Yes
Genre dummies	Yes	Yes	Yes	Yes	Yes
Games	918	918	918	918	918
McFadden's adjusted R^2	0.37	0.44	0.45	0.44	0.45

Note. Heteroskedasticity robust standard errors reported in parentheses.

** $p < 0.01$; * $p < 0.05$; + $p < 0.10$.

Figure 2. Average Predicted Probabilities and Marginal Effects (Hypothesis 2)



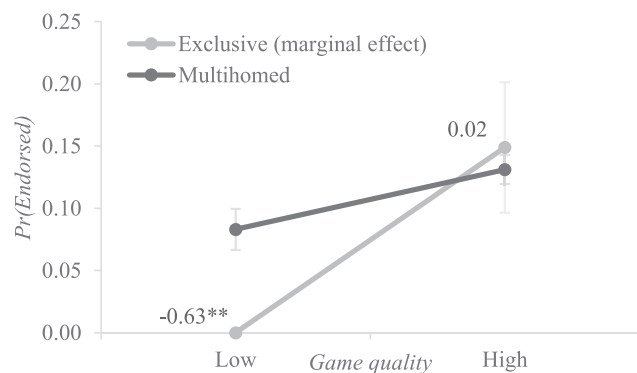
Note. Data labels list marginal effect sizes, or the estimated differences in the predicted probabilities between both slopes, at different values of the independent variables.

** $p < 0.01$; * $p < 0.05$; + $p < 0.10$

an average predicted probability of endorsement equivalent to 7.60%, and games in high-value genres (*value of genre* = 0.80 or one standard deviation above the mean) with no prior hit have an average predicted probability of endorsement of 23.33%. Moreover, the difference between predicted probabilities for games in genres with and without any prior hits is statistically significant when *value of genre* takes values above 0.60 or below 0.30, which includes approximately half the observations in our sample.

We note partial support for Hypothesis 3. Although the interaction term between *platform exclusive* video games and *high quality* video games is positive and significant ($p < 0.01$) as well as significantly different from any of the other counterfactual scenarios ($p < 0.01$), the average predicted probabilities and marginal effects reported in Figure 3 show that the differences between platform-exclusive and multihomed games primarily resides in the subsample of low-quality video games: although the average predicted probability increases from near zero for

Figure 3. Average Predicted Probabilities and Marginal Effects (Hypothesis 3)



Note. Data labels list marginal effect sizes, or the estimated differences in the predicted probabilities between both slopes, at different values of the independent variables.

** $p < 0.01$; * $p < 0.05$; + $p < 0.10$

platform-exclusive games with low quality scores to 14.89% for platform-exclusive games with high quality scores, so does the predicted probability for multihomed games increase from 8.31% for games with low quality scores to 13.12% for multihomed games with high quality scores. Furthermore, the difference in predicted probabilities between high-quality platform-exclusive games and high-quality multihomed games is not significantly different from zero.

Our control variables mostly load as expected.¹³ We find support for our baseline prediction that high-quality games are more likely to receive an endorsement than low-quality games ($p < 0.05$). The predicted probability of *high quality* is 8.52% higher than that of low-quality games. The effect of a game's sales in the European market on being endorsed is positive and significant ($p < 0.01$). The predicted probability of receiving an endorsement increases by 31.86% from one standard deviation below the variable's mean to one standard deviation above. The effect of the *number of past endorsements* a publisher received from the platform is also positive and significant ($p < 0.05$). The predicted probability increases by 0.43% from one standard deviation below the variable's mean to one standard deviation above its mean. We find no support that platforms are more or less likely to endorse games from older publishers because the effect of *publisher age* is positive but not significantly different from zero. Finally, we find that the effect of a game's publisher being listed on a major stock exchange is negative and significant ($p < 0.10$), implying that platform sponsors are more likely to endorse games from publishers with fewer resources, consistent with our arguments about up-and-coming complement producers. The predicted probability of being publicly traded is 4.91% lower compared with privately held video game publishers.

Results for When Platforms Choose to Endorse Games

We restructure our data to analyze how platforms' decisions to issue endorsed video games are affected by the temporal dynamics at the platform level. Specifically, we create a platform-genre-month panel data set containing 30 panels for 15 genres on both platforms. Our data allow us to trace the number of endorsed rereleases within each genre-month from the start of our data in 2007 up to the last month of 2011, resulting in a data set of 1,770 observations. We test whether platform sponsors release more endorsed games during months when there are fewer new releases at the platform-genre level. We isolate the effect of our independent variable by including platform, genre, and calendar month fixed effects. We also control for life cycle dynamics by including the platform's age in months. Given that our outcome

Table 3. Descriptive Statistics and Pairwise Correlations for Hypothesis 4

Variable	Mean	Standard deviation	Minimum	Maximum	1	2
1. <i>Endorsed rereleases</i>	0.10	0.36	0.00	5.00		
2. <i>Platform age</i>	36.62	18.42	1.00	73.00	0.10	
3. <i>New game releases</i>	0.78	1.44	0.00	13.00	0.24	0.11

Notes. Based on estimation sample of 1,770 observations (i.e., 870 genre-month observations for PS3 and 900 genre-month observations for Xbox 360). All pairwise correlations are significant at $p < 0.05$.

variable is a count measure and our data are structured as a longitudinal panel, we estimate a Poisson panel regression model. We report heteroskedasticity robust standard errors clustered at the platform level.

Table 3 reports summary statistics and pairwise correlations. Table 4 reports main results as they pertain to Hypothesis 4. Model 1 of Table 4 estimates fixed effects, Model 2 adds the effect of *platform age*, and Model 3 includes the number of *new game releases*. We focus on Model 3 for the interpretation of our results. As shown in Table 4, the coefficient for *new game releases* is negative and significant ($p < 0.05$), indicating support for Hypothesis 4. Exponentiating the regression coefficient lets us interpret the estimated rate ratios: one additional same-genre game entering the platform, while keeping all other covariates constant, is associated with a 5.67% lower endorsed rerelease rate ratio. Consistent with the argument about leveraging platform endorsements to attract and direct late adopters on the platform (Rietveld and Eggers 2018), we find that the coefficient for *platform age* is positive and significant ($p < 0.01$). A one-month increase in *platform age* is associated with a 2.03% higher endorsed rerelease rate ratio. Our reported results are robust to using the log-transformation of *new game releases* as well as to estimating the coefficients using a negative binomial regression model.

Robustness Tests

We subjected our findings to a number of robustness checks.¹⁴ First, we assessed the robustness of our

findings for Hypothesis 1 by estimating our models using alternative thresholds for video games' initial sales performance: *top 1% sales rank*, *top 2%–5% sales rank*, *top 6%–20% sales rank*, and *bottom 80% rank* (base). Our main results remain fully supported in this alternative specification.

Second, we checked the sensitivity of our findings for Hypothesis 2 by using the raw value of a game's genre (i.e., the sum of first-month unit sales for all games in the same genre, platform, and year) instead of the percentage-ranked transformation and find that our support for Hypothesis 2 persists. We also confirmed that our results are robust to the exclusion of genre dummies from our models.

Third, further assessing our results for Hypothesis 3, we reestimated our models using the continuous *Metascore* as our measure of quality. We find a positive and significant effect of *Metascore* on the probability of being endorsed, whereby the average predicted probability for games with Metascores above 40 is significant. In the interaction between *Metascore* and *platform exclusive*, we find that for Metascores equal to or above 80, platform-exclusive games have a higher predicted probability of being endorsed than multihomed games. Similar to our main results, however, the marginal effects are not statistically significant. We also estimated an endogenous treatment effects model in which we endogenize *platform exclusive* and allow for correlation between the error terms in both equations. We find that such a correlation exists, suggesting that *platform exclusive* is

Table 4. Poisson Panel Regressions Estimating the Number of Endorsed Rereleases (Hypothesis 4)

Variable	Endorsed rereleases		
	1	2	3
<i>Platform age</i>		0.02** (0.01)	0.02** (0.01)
<i>New game releases</i>			−0.06* (0.03)
<i>Constant</i>	−1.58** (0.06)	−2.40** (0.31)	−2.29** (0.37)
Platform dummies	Yes	Yes	Yes
Calendar month dummies	Yes	Yes	Yes
Genre dummies	Yes	Yes	Yes
Platform-genre-month observations	1,770	1,770	1,770
Log pseudolikelihood	−430.01	−421.17	−420.59

Note. Heteroskedasticity robust standard errors (in parentheses) clustered at the platform level.

** $p < 0.01$; * $p < 0.05$; + $p < 0.10$.

indeed endogenous. That said, and controlling for this endogeneity, we confirm that our main results remain supported.

Fourth, we further validated the results pertaining to Hypothesis 4 by replacing *platform age* for the stock of games at the platform-genre-month level to control for the number of games from which a platform owner can potentially select for promotion. Expectedly, we find that *stock of games* has a very similar effect as *platform age*, and our main results remain supported. We also added additional control variables to the models testing Hypothesis 4 by measuring the average quality of the games released in a particular month and genre, and by documenting the share of games that are platform exclusive. Neither of these variables is statistically significant, and the main results for Hypothesis 4 remain unchanged.

Fifth, to rule out alternative explanations at the firm level, we reran our models with firm fixed effects on a restricted sample of 763 video games by publishers with more than one game in our sample and at least one endorsement received. Our findings are robust to this alternative specification. Our results are also robust to the following alternate model specifications: adding *platform age* as an additional control variable, including a control variable indicating whether a game was *endorsed on a competing platform*, and adding as an additional control variable the number of video games released by a game's publisher on consoles by the focal platform sponsor over a rolling time period of five years.

Discussion and Conclusions

Value creation and capture are complex in platform ecosystems (Pierce 2009, Jacobides et al. 2018). The value of the overall ecosystem is influenced not only by the quality of individual complements but also by their interactions (Adner and Kapoor 2010). Although previous work has emphasized the importance of a platform attracting high-quality complements to its ecosystem, we extend that work by explaining the more complex strategic choices the platform sponsor must make in managing the overall value of the ecosystem and how the sponsor can influence that value through selective promotion of complements.

Although selective promotion at first appears to be a relatively simple lever employed by the platform sponsor, its strategic use and performance effects are quite complex. Platform sponsors do not just promote best-selling complements; instead, they are using promotion to achieve myriad objectives in the management of their ecosystems. Using a large data set on the endorsements of seventh-generation video games in the United Kingdom, we found that platform sponsors select games for endorsement not only based on their quality and sales performance but also

on the degree to which they can unlock unrecognized value in the game and the game's potential to enhance the balance of the overall portfolio. Specifically, platform sponsors were more likely to endorse games that had high quality and good initial sales but were not market leaders. Additionally, they were more likely to endorse games that were in a high-value genre in which the platform had no prior top-selling video game. Quality and platform exclusivity had an interesting interaction. We had expected that exclusive and high-quality video games would be even more likely to be endorsed than multihomed and high-quality video games. Instead we found that exclusive and high-quality games were about equally likely to be endorsed as nonexclusive and high-quality games (no significant difference), but that exclusive games of low quality were significantly *less* likely to be endorsed than nonexclusive games of low quality. We believe this is because many games are exclusive by default; they are not popular enough to warrant multihoming (Anderson et al. 2013, Cennamo et al. 2018), and an exclusive and low-quality video game is likely an exclusive-by-default game. Such games are unlikely to be endorsed. Finally, we looked at the timing of selective promotion. Consistent with our arguments about life cycle management and competitive crowding, we found that platforms made more endorsements during periods when there were fewer new game releases within the genre.

Our paper is the first we know of to look at the complex strategic choices a platform sponsor makes in using selective promotion to manage its ecosystem. In so doing, it contributes both theoretically and empirically to our understanding of how platform sponsors govern their ecosystem. This is a topic of increasing interest and importance to both scholars and managers; digitization is enabling many industries to be restructured as platforms, and platform ecosystems are playing increasingly central roles in the global economy. The results of this study readily generalize to other platform settings: operating systems that must decide which software applications to highlight, music-streaming services that choose which artists to include in curated playlists, crowdfunding platforms that decide which projects to prominently feature, and so on. For managers of platforms, the results help to provide a more complete picture of how selective promotion can be used to manage the ecosystem's value creation as well as its value capture. Our results also highlight the key dimensions that distinguish platform ecosystems from more typical reseller settings and when we would expect reseller settings to behave more like platform ecosystems. First, our arguments highlight that because the ecosystem must be attractive to end users for any individual complement producer to capture value, the many different complements in a platform ecosystem are vested in each other's success. Although

complements are competing with one another, they also need other complements in the ecosystem to be successful. Furthermore, because participation in a platform ecosystem requires investments in cospecialization, the relationships between a platform and its complements are stickier and longer term. At a minimum, it must manage their success over the entire platform life cycle; it may also invest in its relationships with complement producers over multiple generations of the platform.

One of the limitations of our study is that we cannot directly observe how the value created in the ecosystem is divided among the platform sponsor and its complementors (i.e., we cannot directly observe value capture or costs). In the video game industry, game-specific licensing revenues and royalty rates are closely guarded secrets, redacted from publicly available financial reports. It is generally understood that games get royalty breaks (i.e., their publishers pay lower royalties to the console producer) as they pass certain sales thresholds. It is not uncommon, for example, for a licensing agreement to specify five or more levels of unit-sales goals with decreasing royalty rates above each level. Furthermore, these levels are negotiated based on the bargaining power of the game at the time it goes into negotiations for the licensing contract. Both of these dynamics were evidenced in the explanation provided to us by an executive at games publisher Take-Two Interactive: “Games that achieve superb commercial success receive a royalty break along the way,” and “with size and quality, definitely comes the power to negotiate better rates.” This means that, in general, lower-selling video games are paying a higher royalty rate than top-selling video games, and at some sales levels, the console producer captures more value by using promotion to increase the sales of lower-selling games than it does by promoting top-selling games. Although we have provided some initial exploration of the complement’s bargaining power by looking at publisher age, listing status, prior endorsements, and exclusivity, future research should attempt to more fully examine the interplay between promotion, bargaining power, and value capture.

The video game console industry is an iconic platform market in which players have had many generations to refine their understanding of how to use selective promotion to their best advantage. The findings here thus should be informative for managers in newer platform settings in which players have had less time to accrue such experience. Our results show that platform sponsors can and should use selective promotion not just to reward hit products but also to create new stars and to manage both the range of the overall ecosystem and temporal variation in its product catalog. For managers of complements, the results suggest that up-and-coming complements have more opportunity to gain preferential treatment by the platform than it may first appear. The promise of future growth and commitments to exclusivity can provide strong inducement to a platform sponsor to invest in the complement’s success.

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Appendix A. Examples of Endorsed Video Games

Figure A.1. (Color online) PlayStation 3 Game Covers for *Uncharted: Drake's Fortune* (Published by Sony Interactive Entertainment)



Figure A.2. (Color online) Xbox 360 Game Covers for *Grand Theft Auto: IV* (Published by Take-Two Interactive)



Appendix B. The Effect of Platform Endorsements on Game Sales

To validate the positive effect of endorsements on sales, we analyze video games' *unit sales* at the game-platform-week level. We expect unit sales to be higher in weeks in which a video game is endorsed compared with weeks when it is not endorsed while controlling for game age and for other game-related and external factors. We further seek to validate the suggested mechanism underlying Hypothesis 1: that games with lower initial sales performance stand to benefit more from selective promotion.

The Effect of Selective Promotion on Game Sales

Identification Strategy. To identify the effect of platform endorsements on sales, we use a difference-in-difference (DiD) estimator. The main advantage of this method is that it mimics a quasi-experiment because our treatment effect is applied to different games at different times in their life cycles. The DiD estimator contrasts the pretreatment trend in games' unit sales to the posttreatment trend for the subsample of games that received the platform endorsement (i.e., "treatment group") with those that never received an endorsement and those receiving an endorsement later in their life cycle (i.e., "control group"). The net effect is quantified as the difference in games' weekly unit sales as an effect of the treatment.

The key identifying assumption of the DiD estimator is that the pretreatment trends for the treatment and control groups are identical (Angrist and Pischke 2008). Because we established that platform sponsors strategically select video games for endorsement, it is imperative to look for a control group that closely resembles the treatment group to estimate the counterfactual. We identify the effect of platform endorsements on game sales by exploiting a unique feature of our data: we narrow our focus to a subsample of 25 game pairs that multihomed on PlayStation 3 and Xbox 360 but receive an endorsement on only one of these consoles.¹⁵ A game that multihomes is nearly identical in its aesthetic design, structural characteristics, gameplay, release date, marketing budget, and technical performance. Because the game is close to identical on both platforms but endorsed on only one platform, we can minimize any *ex ante* heterogeneity that may exist between observations in the treatment and control groups. Figure B.1 compares the average weekly unit sales for the 25 game pairs for the eight-week period before and after the normalized time of endorsement. The figure clearly shows that (1) there exist parallel pretreatment trends and (2) average game sales spike for the treatment group immediately after receiving the endorsement. Note that the values in this graph are group-level averages and that the games in the control group are nearly identical counterparts that might benefit from spillover effects from the endorsement.

We impose an additional restriction on our data: to account for games' exponentially downward-sloping sales curves (see Figure 1), and to best isolate the effect of endorsements on sales, we limit the sample to the eight weeks before and eight weeks after the normalized time of

endorsement. The sample therefore includes 16 game-week observations for each of the 25 game pairs. The final sample for estimation includes 782 game-week observations; 18 game-week observations are missing because some video game life cycles stretched beyond the data-collection period for our study.

Because our outcome variable is continuous, we estimate coefficients using a fixed effects ordinary least squares (OLS) panel regression. To account for autocorrelation, we cluster standard errors at the game-platform level (Bertrand et al. 2004). The estimation takes the following form:

$$y_{ijt} = a_{ij} + \eta_t + \beta D_{ijt} + X_{ijt}\delta + \varepsilon_{ijt},$$

where y_{ijt} is a game's weekly unit sales, a_{ij} is a vector of game-platform fixed effects, η_t is the vector of game age fixed effects, βD_{ijt} is the vector of endorsement treatments to be estimated, $X_{ijt}\delta$ is a vector of time-varying control variables (i.e., platform-year-month fixed effects to control for any platform-side variation, including competition and installed base size), and ε_{ijt} captures the error term.¹⁶ To test whether games with lower initial sales performance experience greater sales increases from receiving an endorsement, we include the interaction between *endorsed* and *lower initial sales*. Because our estimation sample is restricted to endorsed video games and likely all have high initial sales performance, we take the sample's median as a threshold to identify games with lower prior sales performance. *Lower prior sales* takes the value of 1 for games that have first-month unit sales that are below the sample median.

Main Results. Table B.1 reports summary statistics for the main variables in our analysis, and Table B.2 reports our main results. Models 1 and 2 estimate the treatment effect on the full sample of 25 game pairs, Models 3 and 4 estimate results on a restricted sample of treated-only games (variation comes from the treatment being implemented at different moments in a game's life cycle), and Models 5 and 6 estimate results on a restricted sample of control-only games to test for spillover effects.

Consistent with our arguments, we find a positive and significant effect of *endorsed* on games' weekly unit sales in Model 1 ($p < 0.05$) and a positive interaction effect between *endorsed* and *lower prior sales* in Model 2 ($p < 0.01$). On average, endorsed video games sell 269.43 units per week more than nonendorsed games in the eight-week period following the endorsement. Moreover, this effect is mostly driven by games with lower prior sales performance because these games enjoy a sales increase of 730.51 units per week, and games with higher initial sales performance enjoy a (nonsignificant) increase of 24.66 units per week. These results suggest that platform endorsements do not affect all video games equally, consistent with Hypothesis 1. Our results become more pronounced in Models 3 and 4, which replicate our results on a restricted sample of treated-only games. The results in Model 4 suggest that games with lower initial sales enjoy a sales increase of 765 units per week following the endorsement ($p < 0.05$), and endorsed

The graph displays the average weekly unit sales for two product categories: Endorsed (dark grey line with circular markers) and Nonendorsed (light grey line with circular markers). The x-axis represents the time relative to the platform endorsement, ranging from 8 weeks before to 8 weeks after. The y-axis represents the average weekly unit sales, ranging from 0 to 1,400. The endorsed products show a significant increase in sales starting around 2 weeks before endorsement, peaking at approximately 1,000 units per week at week 2, and then gradually declining. The nonendorsed products show a much more stable sales pattern, with a slight dip around week 6 and a peak around week 7.

Weeks before and after platform endorsement	Endorsed (Average weekly unit sales)	Nonendorsed (Average weekly unit sales)
-8	950	850
-7	900	750
-6	850	650
-5	830	630
-4	830	650
-3	750	630
-2	730	600
-1	730	550
0	730	400
1	780	420
2	1000	450
3	780	450
4	620	480
5	550	500
6	550	480
7	500	600
8	500	550

Relative Time Model. As noted previously, identification of the treatment effect is only valid to the extent that there exist no differences in the pretreatment trends between endorsed and nonendorsed video games. One concern is that sales for a certain video game on one platform are leveling off at a somewhat slower rate compared than the same game on a competing platform. A platform sponsor may see a greater potential for boosting a game's unit sales precisely because of this slower decay, which would then violate the parallel trends assumption. To rule out this concern, we implement a relative time model of which the main benefit is that it allows for different lags and leads of the treatment effect (Autor 2003). An additional advantage of this model is that it provides insight into the dynamics of the treatment effect: whether the effect of endorsement is constant or perhaps first picks up and then mean reverts after an endorsed video game has been on the market for a longer period of time.

Notes. Mean differences between nonendorsed and endorsed video games estimated using two-sample *t*-tests. GBP, Great British Pound. $^{**}p < 0.01$; $^{*}p < 0.05$; $+p < 0.10$.

Table B.2. OLS Panel Regressions Estimating the Effect of Platform Endorsements on Weekly Unit Sales

Variable	Weekly unit sales					
	1	2	3	4	5	6
<i>Endorsed</i>	269.43* (126.46)	24.66 (102.14)	570.51* (233.54)	265.81* (127.36)	33.01 (136.62)	111.73 (181.42)
<i>Endorsed</i> × <i>lower prior sales</i>		730.51** (188.79)		765.00* (354.23)		−154.45 (198.05)
<i>Constant</i>	4,197.04** (765.74)	3,959.63** (861.93)	5,730.65** (1,128.30)	5,629.85** (1,101.20)	3,297.70** (443.02)	3,465.69** (887.88)
Game dummies	Yes	Yes	Yes	Yes	Yes	Yes
Game-age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Platform-year-month dummies	Yes	Yes	Yes	Yes	Yes	Yes
Game-week observations	782	782	391	391	391	391
Games	50	50	25	25	25	25
R ² (within)	0.63	0.65	0.73	0.74	0.83	0.83

Notes. Heteroskedasticity robust standard errors (in parentheses) clustered at the game-platform level. Models 1 and 2 estimate the treatment effect on the full sample of 25 game pairs (treatment and control groups). Models 3 and 4 estimate the treatment effect on the subsample of 25 treated-only games. Models 5 and 6 estimate the treatment effect on the subsample of 25 control-only games.

** $p < 0.01$; * $p < 0.05$; $p < 0.10$.

weeks a game is on the market, after which it levels off. The positive effect of *endorsed* on video games' weekly unit sales loses statistical significance after five weeks, equivalent to a cumulative sales increase of 2,742 units.

Robustness Tests. We subjected our findings to a range of robustness checks.¹⁷ First, to further exploit the uniquely matched nature of our data, we conducted a matched-pairs estimation wherein we subtract the unit sales of control group games from those of treatment group games for each week within each pair of identical games. We then regressed the difference in weekly unit sales on *endorsed* in a model that includes matched-pair fixed effects (Besley and Burgess 2004). Lending further support to our main results, we find that the difference in sales between endorsed games and their nonendorsed counterparts increases by 761.13 units per week in the period following the endorsement. Second, this matched-pairs analysis also allows us to control for any differences in selling prices between games by including a variable that measures the difference in selling price between two "twin" games. Although we find that a 1 Great British Pound (GBP) higher selling price leads to a nonsignificant drop in sales of 22.61 units per week, the positive effect of *endorsed* on sales persists, suggesting that the sales increase effect is driven by the endorsement more so than by the drop in video games' selling price. Third, we reestimated our models with the inclusion of treatment-specific time trends. Including treatment-specific time trends is an alternative way of controlling for unobserved heterogeneity in time trends between treated and control group observations (Besley and Burgess 2004). Here, too, our main findings remain unchanged. Fourth, we ran a series of falsification checks to rule out the possibility of a false-positive association. We reestimated our main analysis on a sample of preimplementation observations by creating a vector of endorsement dummies in which we bring forward the implementation of the endorsement by 16, 12, and 8 weeks. We then regenerated the estimation sample based on these normalized "placebo" treatments and repeated our analyses. We find no significant effects of any of the placebo treatments on weekly unit sales in any of the weeks preceding the platform sponsor's endorsement of a video game, strengthening the confidence in our results. Finally, we reestimated the results by fitting the models with AR(1) disturbances as an alternative way to account for autocorrelation. Our main results remain supported.

Endnotes

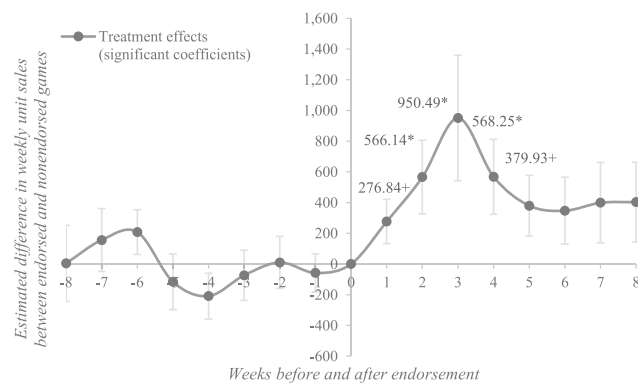
¹ Source: <http://venturebeat.com/2014/04/24/apps-featured-by-apple-or-google-get-6-times-the-downloads-and-9-times-the-revenue-or-nothing/>—last accessed January 2019.

² In some cases, complement producers are competing directly against the platform sponsor itself when the platform sponsor also produces complements (see, e.g., Gawer and Henderson 2007, Zhu and Liu 2018).

³ For an extensive literature review, see McIntyre and Srinivasan (2017).

⁴ An additional benefit of promoting up-and-coming complements is that their producers may have less bargaining power, which can

Figure B.2. Dynamic Effect of Platform Endorsement on Weekly Game Sales



Notes. Data labels list estimated differences in weekly unit sales between endorsed and nonendorsed video games. Only estimated differences that are statistically significant are listed.

** $p < 0.01$; * $p < 0.05$; + $p < 0.10$

translate into better terms for the platform and greater loyalty to the platform.

⁵Notably, this argument is partially consistent with research on promotion in reseller settings. Although resellers may have little incentive to invest in unlocking the star potential of up-and-coming products and instead usually leave that to the manufacturers themselves, they are more likely to promote products from whom they capture larger margins, such as private-label brands (Ailawadi and Harlam 2009).

⁶This is partially analogous to a reseller's decision to cut the price of a leading product in an important category to drive traffic to the store—a process known as creating *loss leaders* (Pancras et al. 2013). Like the platform sponsor, with loss leaders the reseller is using price promotion to drive traffic to the store, similar to the platform sponsor's motive to drive customers to its platform. However, the key difference is that the reseller uses the price cut to amplify the draw that a leading product already has, whereas we argue that the platform sponsor uses selective promotion to create a new star in a product category in which no products have yet emerged as stars on its platform. This highlights again the longer-term commitment between a platform sponsor compared with a reseller and the more significant role the platform sponsor plays in orchestrating the value of the overall ecosystem.

⁷Source: <https://web.archive.org/web/20080820143738/http://mt.playstation.com/ps2/news/ps2-goes-platinum-part-1.html>—last accessed January 2019.

⁸We exclude Nintendo's Wii from our analyses because it is a fundamentally different kind of console that competes on different dimensions from the Xbox 360 or PlayStation 3. First, it has different technical specifications for the motion-controlled “Wii-mote” that enables physical activity gameplay. This means that many games developed for Wii could have never been developed for Xbox 360 or PlayStation 3 until their (much later) development of motion-controlled interfaces. Second, the Wii had a different market positioning (lower cost, lower speed, no ethernet connectivity). It was also targeted toward casual gamers who had not previously been part of the gaming demographic. In fact, it even became popular as an exercise aid in nursing homes and for bowling leagues on cruise ships. Evidence of the fundamentally different nature of the Wii can be seen in the statistics on multihoming: whereas more than 50% of the games available on PlayStation 3 are also available on Xbox 360 and vice versa, only 8% of games for the Wii were available on the Xbox 360, and less than 3% were available on the PlayStation 3.

⁹Confirming differential treatment for first-party video games, a director of sales planning and analysis at Sony PlayStation told us: “We use Platinum very differently for the games we release as a first-party publisher. For example, we will use two Platinum games to make a bundle with our hardware, which is different obviously from games by third-party publishers.” Lending support to potentially differential treatment is the fact that 31% of the internally published (versus 11% of third-party) video games in our sample received an endorsement. Note that we do still consider these first-party games in the construction of market-level variables (e.g., *value of genre*).

¹⁰We acknowledge that there is a growing interest in the platforms literature for why complements multihome (Corts and Lederman 2009, Landsman and Stremersch 2011, Cennamo et al., 2018), suggesting that *platform exclusive* may be endogenously determined. Although we consider fully modeling the decision for games to be launched exclusively on one platform to be beyond the scope of our study, we have estimated an endogenous treatment effects model as a robustness test, and the results are consistent with those reported in our main results.

¹¹The base group for *high quality* includes games with Metascores below 75 and games with missing Metascores. Ninety games in our sample have no Metascore registered on Metacritic. Having no Metacritic score generally signifies a very poor-quality video game. Because none of these games were endorsed, we cannot control for this subgroup separately. In our robustness tests we use the continuous Metascore and drop games with missing Metascores.

¹²Because only a fraction of the firms in our sample receives endorsements, we cannot include firm fixed effects in our models (many dummies predict failure perfectly). Our results, however, are fully consistent when we estimate fixed effects models on a restricted sample of games by publishers that have received at least one endorsed rerelease.

¹³Because variables' effect sizes in nonlinear models depend on the values of the other covariates in the model, Wiersema and Bowen (2009) caution against the interpretation of results (for first-order terms) in models that include interactions or log-transformations. For this reason, we have estimated a model that includes only first-order effects (i.e., no interactions), in which none of the control variables are log-transformed. The results from this model are consistent with what is reported in our main analysis. We find that *high-quality* video games have a 7.44% higher predicted probability of endorsement than low-quality games ($p < 0.01$). *Console exclusive*, *value of genre*, and *no prior hit in genre* have no significant first-order effects on endorsement. The direction and overall interpretation of our log-transformed control variables remain the same in this “natural” model.

¹⁴Tabulated results from these tests are available from the first author on request.

¹⁵The list of 25 game pairs used for estimation is available from the first author on request.

¹⁶Notwithstanding the fact that endorsed rereleases are often accompanied by a lower recommended retail price, we do not control for games' selling prices in our models primarily for two reasons. First, although we observe in our data that prices of games drop shortly after the launch of an endorsed rerelease, we also observe that prices of nonendorsed games decline. The maximum average difference in weekly selling prices between endorsed and nonendorsed video games at any point in the 16-week period surrounding the endorsement is 2.08 GBP (the average overall difference between price in both types of games is 0.08 GBP, as shown in Table B.1). Second, this difference in actual selling prices is likely explained by the fact that retailers strategically adjust games' selling prices to influence demand over a game's life cycle. Selling prices thus are endogenously determined in large part by video games' sales

performance in the previous period. Including selling prices in a model predicting weekly unit sales would be fruitless given the high correlation with the outcome variable. That being said, in one of our robustness tests, we do control for differences in selling prices between matched pairs of nearly identical games and find that the main effect of selective promotion persists.

¹⁷ Tabulated results from these robustness tests are available from the first author on request.

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