# Vertical Integration, Exclusivity and Game Sales Performance in the U.S. Video Game Industry

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**Abstract**

This paper empirically investigates the relation between vertical integration and video game performance in the US video game industry. For this purpose, we use a widely used data set on video game monthly sales from October 2000 to October 2007. We complement these data with information on video game developers and the timing of all mergers and acquisitions during that period allowing us to separate vertically integrated games from those independent games exclusive to a platform. First, we show that vertically integrated games are associated with higher sales and higher prices than independent games. Second, we explore whether the link between vertical integration and performance in this industry is due to selection or value added. Our results suggest that most of the difference in performance is due to value added from better release strategies and selection from ex-ante differences in video game quality. In our sample of games, post-release marketing strategies do not seem to add value to vertically integrated games. We also find that platform-exclusive independent games are associated with lower demand and higher prices.

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# 1 Introduction

The study of the determinants and consequences of the boundaries of the firm has a long tradition in economics. From Coase (1937) through the works of transaction cost economics (Williamson, 1975, 1985 and Klein, Crawford and Alchian, 1978), property rights (Grossman and Hart, 1986) and incentive-based theories (Holmstrom and Milgrom, 1991, 1994) to relational contracting (Baker, Gibbons and Murphy, 2002), our understanding of the benefits and costs of vertical integration has only been dwarfed by the limited empirical literature that tests and feeds these theories. Moreover, while most empirical work so far has focused on traditional manufacturing and service industries (car, textile, coal, movies, etc[1]), the existing literature has yet to provide insights of the benefits and costs of vertical integration in the new emerging creative industries. These industries contrast with others in that they function as networks and that distributors of content acquire rights from creators to distribute it on existing platforms. Since access to high quality content and network management[2] is of utmost importance for platform success, vertical integration guarantees control over assets (human capital in creative industries) producing and evaluating high quality content.[3]

Moreover, the study of contracting for innovation presents new challenges to organizational economists and contract theorists as the production function for innovation is unlikely to include tasks that are easy to specify. This factor increases both the

[1] Lafontaine and Slade (2009) provide an extensive summary of this literature while emphasizing the need for more empirical work on both the causes and consequences of vertical integration.

[2] See Casadessus ans Halaburda (2010) for a recent discussion.

[3] Highly publicized (and not always successful) examples of such marriages between distribution and content include AOL-Time Warner and Disney-Pixar among others.

costs of managing and outsourcing innovation (Gil and Spiller, 2007). Understanding benefits and costs of contracting in innovative industries becomes then very important from the managerial and policy perspectives as the economy increasingly relies on these sectors. In this paper, our goal is to contribute to this literature by presenting in an integrated manner contractual frictions involved in the development and market delivery channels of content in a creative industry such as the U.S. video game industry as well as empirically investigating performance differences between vertically integrated and independent video games to highlight the impact on outcomes of circumventing these frictions through vertical integration.

The U.S. video game industry is a particularly good setting to study the costs and benefits of vertical integration in recently emerging creative industries due to the strong competition between platforms. As of 2008, this industry experienced record sales of around USD 22 billion only in the U.S. and more than USD 40 billion globally. As a result, competition between the three main platforms intensified considerably as Nintendo Wii and Sony's PS3 caught up aggressively to an early first mover advantage of Microsoft's XBOX360. A direct consequence of the rapid sales growth and competition in this industry has been that distributors of content (called publishers) have acquired an increasing amount of successful independent developers in the pursuit of the next hit game, as a way to control and retain key creative talent. Once content is created (software), publishers market these to one or more platforms or consoles (hardware). Platforms (hardware owners) may also own or acquire both publishers and developers to ensure a steady supply of content (software). Yet, we know little about the consequences

of these acquisitions and other contractual practices aiming to monopolize the use of talent within the same vertical structure and so this paper fills a gap in the literature by shedding light on this question.

Our analysis differs from the existing platform literature[4] in that we focus on the game as unit of analysis and more precisely the impact of the contractual relationships between developers and publishers on game performance. Existing studies have mainly focused on vertical integration between publishers and platforms while proxying vertical integration with software exclusivity (Lee, 2013 and Derdenger, 2008). Due to the high correlation between exclusivity and vertical integration, this approximation is harmless when the goal of the study is to quantify the impact of network effects on hardware demand. Nevertheless, this could be misleading if the final goal is to understand the role of vertical integration (as opposed to exclusivity) in video game production and video game demand. We alleviate this problem by collecting information that separates vertically integrated games from platform-exclusive games and provide new evidence on the impact of vertical integration in the U.S. video game industry.

Building on the specificities of the contracting environment in the industry, we construct a simple model that reflects the key contributing factors that explain performance differences between video games developed and published under different organizational forms. Despite its simplicity, the model borrows from the theoretical literatures on the demand for coordination within supply chains, coordination games, double-

[4] Previous papers have mainly focused on both pricing and marketing strategies (see Nair, 2007 or Chiou, 2009) or the role of network effects (see Prieger and Hu, 2006; Chintagunta, Nair and Sukumar, 2007; Corts and Lederman, 2009; and Lee, 2010).

marginalization and moral hazard while assuming away relationship-specific investments. We show that vertically integrated games may collect higher revenues because of better coordination at the development stage between developers and publishers, better release strategies and more effort in promotional activities. Later on, we take the model to the data and test the relevance of each of these factors in the U.S. video game industry.

We obtained our data set from NPD, the leading marketing information provider. It contains monthly video game sales in the U.S. between October 2000 and October 2007. Our data set (widely used by others studying this industry) provides information on both unit sales and revenues for all video games and for all platforms in both the 6th and 7th generation, as well as game publisher, platform and video game genre. We define average monthly price by dividing revenues by sales in the U.S. In addition to this, we complement the information in this data set in two ways. First, we collected information from several industry webpages that detail the identity of the developer of each game (unavailable in the NPD data set). Second, we collected information from several publications regarding all mergers and acquisitions in the U.S. video game industry between October 2000 and October 2007.

Previous papers on the video games industry (Clements and Ohashi, 2005; Lee, 2013; Derdenger, 2008; Corts and Lederman, 2007) focused on the importance of (direct or indirect) network effects on platform demand and platform competition. We analyze a different aspect of the U.S. video game industry. We estimate differences in video game performance due to vertical integration of publishing and developing companies. As highlighted in our stylized model, there are various reasons why vertical integration

might matter for video game performance as incentives of developers, publishers and platforms may not be perfectly aligned. First, vertical integration may solve contractual frictions in video game development that increase game quality and performance as publishers and platform owners have stronger incentives to communicate recent trends in market demand and enhance complementarities with existing hardware when they are to obtain a larger share of the rents. Second, vertically integrated games might be released in "better" periods (Ohashi, 2005) as publishers distribute their own games as well as those of independent developers, and they may prioritize the release of the former over the latter's. Third, and finally, vertical integration may drive publishing companies to advertise their games more (or market them better) after the game has been developed and released than games of others as their marginal return on advertising from integrated games is higher than that from independent games. Our plan here is first to present a simple model that highlights these three distinct sources of contractual frictions. Then we document differences in performance between integrated and independent games and finally disentangle the importance of these three different explanations behind the existing correlation along the lines of our model.

In trying to accomplish the latter, we focus our analysis in a subsample of 3026 games (out of a total of 3385) that contains only developer-publisher integrated games and independent games published by integrated publishers while controlling for as many confounding demand factors as possible that may be unrelated to the channels through which VI affects performance. We estimate demand using a reduced form approach and instrument for price endogeneity while using a large variety of fixed effects that con-

trol for common demand shocks that drive demand at the platform-month-year level. In a nutshell, we take advantage of variation in vertical integration within the lifetime of a video game due to developer acquisitions and use game/platform fixed effects to unravel how correlated vertical integration and game performance are due to ex-post release marketing strategies as these fixed effects hold game quality and release period constant. Following that step, we estimate demand controlling for differences in competition across games due to different release periods using platform/genre/month/year/age fixed effects. When comparing vertically integrated and independent games within the same genre and platform released in the same month and year, persistent differences in performance must be due to differences in either advertising intensity or game quality. The difference between the first and second steps will then provide us with an estimate of the impact of vertical integration on performance through video game quality. Finally, the difference between the second step and the overall gap in performance between vertically integrated and independent games will yield an estimate of the impact of vertical integration on performance through better release periods. Hence, this methodology allows us to establish the relevance of each one of the channels through which VI may affect video game performance while accounting for the importance of network effects and generation effects (Corts and Lederman, 2007).

We separate our empirical results in two groups. First, we establish cross-sectional differences in performance between integrated and non-integrated games. We show that developer-publisher integrated games, publisher-platform integrated games and developer-publisher-platform integrated games sell more units at higher prices (collect

higher revenues) than non-integrated games. We also show that independent exclusive games collect lower revenues and sell less units at higher prices than non-exclusive independent games. Second, we estimate video game demand instrumenting for price and show that demand for integrated video games is higher than independent games. Finally, we explore the source of this difference in demand. Our results suggest that vertically integrated games are better (higher quality or more audience appeal) than the average independent game and that they enjoy better release strategies than independent games. We do not find much support for ex-post release marketing strategies being an important factor in explaining performance differences between independent and integrated games.

Therefore, a simple way to summarize our results is the following: we investigate whether differences in performance between integrated and independent games are due to selection of better video games into larger and integrated firms, or due to value added through better release and marketing management. Our results suggest that most of the difference in performance is due to selection of better video games into integrated publishers and value added on the game release strategies. According to our findings, ex-post release marketing strategies appear to have negligible effects.

These findings are interesting for two reasons. The first reason is one of consumer perception. As the video game industry is a hit market (where only a few games take a substantial share of the market), consumers identify success and quality with a handful of games. These limited set of games are the result of larger budgets and bigger staffs concentrated in larger integrated companies such as Microsoft, Nintendo, Sony, EA, Activision or Ubisoft among others. Nevertheless, our results here show release strategies

contribute as much as video game quality to the observed differences in performance.

Secondly, integrated development of video games is pervasive. According to our data, 50% of video games are developed by an integrated developer and vertical acquisitions of developers are common in this industry. Then our result raises the question of what drives vertical integration in the industry. The popular press has suggested three explanations that we cannot reject in our paper for the large presence of vertical integration in the U.S. video game industry. The first explanation, also suggested by the previous literature, is that network effects are very important in this setting and this would be a reason why publishers and platforms integrate video game development (even if it comes at a cost in video game quality) since platform demand increases. A second potential explanation more aligned with current vertical integration theories (transaction cost economics and property right theories) is that internal production of games is cheaper (than outsourcing game development) in that there are lower transaction costs and adaptation costs of video game development. Finally, a third alternative is that vertical integration and developer acquisition is how large companies in this industry are able to attract and retain high-skill talent that produces future hits and evaluates outsourced content.

The remainder of the paper is organized as follows. Section 2 describes the vertical chain in the video games industry followed in section 3 by a simple model explaining how vertical integration may affect video game sales through the highlighted channels in the institutional details section. We describe our data set in Section 4. Section 5 presents our empirical methodology and cross-sectional findings. We explore the source of causality in the effect of vertical integration in Section 6. Section 7 concludes.

# 2 Institutional Details: Vertical Chains in Video Games

We focus our analysis on video games for consoles, so we first describe the console market.[5] There are three big players in this industry: Sony and its PlayStation, Microsoft and its XBOX, and Nintendo with its Game Cube and Wii. We entered the era of the 7th generation of consoles (XBOX360, PS3, Wii) in 2007 and we are now awaiting for the 8th generation. Our plan is to study the impact of vertical integration on video game performance during the 6th generation (PS2, GameCube and XBOX) and the overlapping period between the 6th and the 7th generations. Hereafter, we call the three main players on the console market the "console companies." Let us first describe the actors in this industry and their contracting environment. We then describe the actual market structure of this industry.

## 2.1 Actors and Contracting Environment

Once a consumer acquires a console, she needs games to complement the purchase of hardware and derive some utility from her purchase. The console companies obtain games from their own internal publishers or independent publishers (not owned by a platform). Publishers may develop the games internally or procure them from independent developers. Let us now describe the functions of each one of these actors and how they interact and contract with each other.

The vertical chain of the production of a video game starts with the development of the game. Developers create the video game and they may either work for a pub-

[5] See Williams (2002) for a detailed description of the video games industry.

lisher (first-party and second-party developers) or be independent (third-party developer). First-party developers are owned by a publisher whereas second-party developers are developers that exclusively work for a given publisher despite being independently owned. The publisher possesses the rights of the game and is responsible for the manufacturing, marketing, market research and advertising. An independent developer contracts with a publisher receiving a combination of milestone payments and royalties. To make sure that milestones are followed and deadlines met, publishers staff producers and project managers that monitor and assist the developer. In a sense, meeting milestones help meeting deadlines and the timely release of a video game in the market. For that reason, project managers must prioritize the preferences of publishers over the wishes of developers in ways that not always sit well with developers.

Coordination between developers and publishers is important because of game testing. Even though developers used to be in charge of game testing, with the growing complexity of the industry publishers are nowadays in charge of this stage using a much larger number of game testers. Testing starts as soon as the first code is written and so if the developer is external (second or third-party) coordination with the QA team (Quality Assurance) from the publisher is more necessary and more costly than when the developer is internal. Anecdotal evidence suggests that there is no standard methodology for game testing and the coordination between developers and QA teams from publishers and so different methods are used in a firm-by-firm basis.[6] A final step requires coordi-

[6] An example of this is Hansoft Technology that provides real-time tracking progress of game development projects. Hansoft Technology has been used by Ubisoft and RED Entertainment among others.

nation with hardware companies because testing is done on special test equipment that are provided to developers and publishers. This equipment differs from consumer units in that it is possible to reproduce copies of the progress and plug additional software and hardware to the test equipment whereas it is not possible to do so in consumer units. Publishers that own platforms then have lower costs of coordination with developers and with console companies than publishers coordinating with external developers and external platforms.

Generally, developers start receiving royalties on sales after milestone payments have been recouped. Publishers also pay a licensing fee to the console companies. All three console companies have their own publishing company but there are also other independent publishers, like Electronic Arts (EA). Independent developers and publishers face a trade-off when deciding whether to have their game exclusive to a unique platform. If they decide to multi-home and distribute their game to several platforms, they increase their de facto market size but they will also increase their development costs and possibly pay higher fees to the platform as the network effects will be weaker than otherwise.[7]

On the other hand, the strategic advantage for console firms to vertically integrate at this stage is that they can preclude the development of a game for other platforms, i.e. creating games unique to one console. This brings additional value for customers and generate network effects that spread to other games within the same platform. Console companies benefit from this value creation in that they are then able to appropriate a

[7] A top executive at EA, the largest independent publisher, recently suggested to adopt a common gaming platform, as consoles have become less compatible over time, making the portability of games to other consoles much more expensive. (BBC News. 2007. EA wants open gaming platform, October 19, 2007)

significant share through higher prices. As we will see in the data section, this makes it particularly important for future dominance to acquire a first mover advantage by introducing as many games as possible before rivals enter the market. This was the case of Sony for the 6th generation, and Microsoft for the 7th generation.

The manufacturing process *per se* obligatorily takes place at the manufacturer's plant, owned by the console companies. The publishers pay a fixed fee by copy of the game to the manufacturer. The console companies earn most of their money from these licensing fees, plus from their own publishing and developing activities, while they break even or even lose money on the console market.[8]

## 2.2 Industry Structure

Overall, there are four types of firms in this industry: solo developers (independent developers that require of an external publisher), solo publishers (they do not develop games internally), integrated developers (firms that publish and develop games), and console companies (these are firms that own a platform, publish and develop their own games). Figure 1 below shows how active each one of these type of companies are in the release of new video games in this industry.

Having presented the types of firms that exist in this industry, there are many ways in which a game can combine developer, publisher and platform. The easier to understand are games that are developed and published by the same publisher and those that are

[8] The final two stages are distribution and retail. Since we do not study these two stages, we only describe them briefly. Distributors store and deliver the product to the retailers (some publishers are integrated at this stage as well). The retail market in the U.S. is dominated by the super stores like Wal-Mart or Toys'R Us. This stage has remained relatively independent so far.

developed and published by a console company. Then we have games that are developed by an independent developer and published by an integrated publisher (that may be owned by a console company). Alternatively, there exist games that are developed by an independent developer and published by a solo publisher. As we show in Figure 1 below, these five types of games represent close to 98% of all games in the industry. A final type of game is one developed by an integrated developer and yet published by an external publisher. These games are uncommon and owe their existence to long-term agreements between developers and publishers that survive developer acquisition by a third publisher.

Finally, it is important to note that the video game market is considered to be a hit market, i.e. a market where sales are very concentrated on only a few extremely successful products. For example, in December of 2007, half a billion dollars was spent on video games for the XBOX360. Out of these, more than 150 million was spent on only two games. Another feature of this market is seasonality since sales are concentrated during a very specific period. This is at the end of the year, in November and December, during the Christmas period: more than 50% of 2007 sales for the Wii and the PS3, and more than 40% for the XBOX360 took place during that period. These are all characteristics that we take into account when analyzing our data.

# 3 A Simple Model

Our model extends the usual elements used in TCE and PRT to an industrial organizion setting (both theoretically and empirically) where integrated and non-integrated

publishers compete for providing content to different platforms and need to coordinate actions with developers. We follow part of the modelling strategy recently suggested by Hart and Holmstrom (2010) and Legros and Newman (2011).[9] We also incorporate standard elements of TCE and PRT such as the non-contractibility of specific actions.

The aim of the model is to illustrate the key trade offs that we believe are important in this specific environment where network effects are important. It involves a sequential game where developers and publishers coordinate their actions; publishers decide on the timing or release; and ultimately about the level of advertising. As such, it provides a "fine tuned" integrative "building block" model in the spirit of Gibbons and Waldman (1999).

### 3.1 Setup

Let us think of a simple model where a publisher faces two options to market a videogame. Under the first option, the videogame is developed internally. Under the second option, the videogame 2 developed independently (external developer). The publisher retains all the revenues from the video game developed internally, while it receives a percentage $1 - s$ over the sale revenues generated by the video game independently developed.

As we discussed in the previous section, video game revenues may differ across firm boundaries due to three effects: higher quality per se, better timing of release, and more advertising (better marketing). We develop here a simple model with three stages

[9] While we use Legros and Newman's (2011) insight about the need of coordination as also noted in TCE, we assume the pricing mechanism is set exogenously. We believe this is a relatively realistic assumption in the game industry where prices are relatively homogeneous between games of the same "age" even if they differ in quality.

that we solve by backward induction where first developers and publishers coordinate actions to create a video game, then the publisher decides on when to release each one of the games and finally the publisher decides how much to invest on advertising and promotional effort.

We characterize revenue generated by each video game $i$ as

$$Sales_i = A * \alpha * f(a),$$

where $A$ is the quality component, $\alpha$ is the release component and $f(a)$ is the advertising component that depends on the advertisement intensity $a$.

### 3.2 Third Stage

In this third stage, $A$ and $\alpha$ are already determined and therefore the publisher has to decide only on the intensity of advertising $a$. This level of advertising is not free and comes at a cost $c(a)$. Therefore when the publisher maximizes profits in this stage she solves

$$\max_a \ (1-s)A^O\alpha^O f(a) - c(a)$$

when advertising the game developed by an external developer, and

$$\max_a \ A^{VI}\alpha^{VI} f(a) - c(a)$$

when advertising an internal video game. Solving FOCs, it is easy to show that at same level of quality and release components and a positive $s$, the publisher will choose to advertise more the internal videogame than the outsourced video game as $c\prime > 0$ as usual and therefore $a^{VI} > a^{O}$, at equal levels of quality and release components. This result follows from the literature on vertical integration and double-marginalization.

### 3.3 Second Stage

In this second stage, and taking $a^{VI}$ and $a^{O}$ as given, the publisher decides when to release both video games. Suppose that there are two periods, I and II. The video game yields a release component $\alpha_I$ if released in period I and $\alpha_{II}$ if released in period II, where $\alpha_{II} > \alpha_I$. If both video games are released in the same period, the video games split the release component and obtain $\frac{\alpha_{II}}{2}$ if released in period II or $\frac{\alpha_I}{2}$ if released in period I.

Similarly to results in the coordination games literature, it is easy to show then that for certain values of $\alpha_{II}$ and $\alpha_I$ and given the solution in the third stage, the publisher will release her internal video game in period II and the independent video game in period I such that

$$\alpha^{VI} = \alpha_{II}$$

and

$$\alpha^{O} = \alpha_I.$$

### 3.4 First Stage

In the first stage, the video game quality is determined through the coordination of actions of developers and publishers. Coordination within organizations and arm's length transactions is a key issue in the study of contracting in innovative industries as it has received much attention recently in the literature from Alonso, Dessein and Matouschek (2008), Dessein, Garicano and Gertner (2010) or Legros and Newman (2011). Our simple model and empirical setting here provide an application for that literature.

For this reason, developers and publishers must coordinate action and expertise to maximize video game potential. The key problem to solve is that the developer might be mostly interested in creating a very innovative video game that the market may not necessary like, while the publisher will want to research and inform the developer of what is marketable and what is not. For this coordination game, we use a similar framework to Legros and Newman (2011) such that the video game quality component $A$ is defined as

$$A = (1 - (d - p)^2)$$

where $d$ is the action of the developer and $p$ the action of the publisher. These actions come at a cost $h(d)$ and $g(p)$ such that

$$h(d) = (1 - d)^2$$

and

$$g(p) = p^2.$$

Taking as given $A$ and $\alpha$, we can solve the maximization problem of the publisher and developer for both the outsourcing and integration case. The case for the integrated video game is simple since the publisher and developer are one and therefore maximize the following function

$$\max_{p,d}(1-(d-p)^2)\alpha^{VI}f(a^{VI}) - c(a^{VI}) - (1-d)^2 - p^2.$$

When solving this problem we obtain $p^{VI} = \frac{\alpha^{VI}f(a^{VI})}{1+2\alpha^{VI}f(a^{VI})}$ and $d^{VI} = \frac{1+\alpha^{VI}f(a^{VI})}{1+2\alpha^{VI}f(a^{VI})}$. This differs from the case when developer and publisher are not integrated as each one of them solves the problem separately such that the publisher faces the following problem

$$\max_{p}(1-s)(1-(d-p)^2)\alpha^{O}f(a^{O}) - c(a^{O}) - p^2,$$

and the developer

$$\max_{d} s(1-(d-p)^2)\alpha^{O}f(a^{O}) - c(a^{O}) - (1-d)^2.$$

When solving for $p$ and $d$ in the resulting game, we obtain

$$p^{O} = \frac{1+(1-s)\alpha^{O}f(a^{O})}{1+\alpha^{O}f(a^{O})}$$

and

$$d^O = \frac{(1-s)\alpha^O f(a^O)}{1+\alpha^O f(a^O)}.$$

This results in that $A^{VI} > A^O$.

### 3.5 Testable Predictions

In the end we have gone through the three stages and derived that revenues of vertical integrated and outsourced games within the same publisher differ such that

$$R^{VI} = A^{VI} * \alpha^{VI} * f\left(a^{VI}\right)$$

and

$$R^O = A^O * \alpha^O * f\left(a^O\right).$$

When taking logs of both expressions, subtracting and decomposing we can show that

$$\ln(\frac{R^{VI}}{R^O}) = \ln(\frac{A^{VI}}{A^O}) + \ln(\frac{\alpha^{VI}}{\alpha^O}) + \ln(\frac{f(a^{VI})}{f(a^O)}).$$

Our model therefore predicts that vertically integrated games will outperform independent games through a combination of three different channels: a quality channel due to better developer-publisher coordination, a release channel due to stronger publisher's incentives over independent games, and finally higher marketing efforts for their own games.

Given that all elements in our model indicate that vertical integration increases

efficiency, all firms should optimally choose to be vertically integrated. However, other factors that we have omitted in our model could also influence the ownership structure decision. On the one hand, we have omitted here size differences between independent and integrated firms. This difference in size may affect differently the amount of resources allocated to internal and external games exacerbating performance differences predicted by this model. On the other hand, private benefits of control can be important in this industry and might impede efficient coordination of actions between actors.[10]

We next take these predictions to the data by first testing whether vertically integrated games outperform independent games. Then we try to isolate the magnitude of each one of these three channels using the rich variation in organizational form across time, within and across games, and across platforms observed in our data set.

# 4 Data Description

We acquired from NPD group (a leading marketing information provider) monthly information on unit sales and revenues for all video games belonging to the 6th and 7th generation in the U.S. between October 2000 and October 2007. We then linked these data to information on video game developer identity from several websites and industry trade publications.[11] Our initial data set contains 3365 games, but we only use

[10] Another explanation is that firms may differ in initial ability (e.g. through developer specific quality) that is not immediately observable so that publishers might find it difficult to find out about developers' ability to develop quality games. The model could then be extended to a dynamic framework where the market gradually learns about this characteristic (see Gil and Warzynski, 2013).

[11] Some of these are GameStats, GameSpot, Gamasutra and, for very few particularly challenging video games, wikipedia.

3026 games in our empirical analysis.[12] As shown in the top half of Figure 1, we keep games that are published by integrated publishers and developed either internally (1652 games) or by an independent developer (1374). By doing this, we match our analysis to the model above. Another advantage of focusing in this sample of games is that this approach allows us to define exactly the type of non-integrated games that we are comparing the integrated games to. See in the bottom half of Figure 1 that we dropped 339 games that were either developed and published by separate independent companies (270 games) or developed by an integrated developer but published externally through an independent publisher (15 games) or another integrated publisher (54 games).[13]

Table 1 shows summary statistics of monthly sales, monthly revenues and monthly average prices (mainly the result of dividing revenues by sales) and vertical integration variables that we will be using in our empirical analysis below. We observe that on average a game sold at $22, sold almost 6,600 units a month and collected $241,000 a month. Our data also shows that a game stays on its run an average of 24 months. When breaking our data set by integration and exclusivity status, the next four columns indicate that all three types of integration show larger averages of sales, revenues and prices (except for prices of publisher-platform integration) than the overall sample de-

[12] The intial data contains information for 3385 games but we detected the presence of outliers. For this reason, we dropped all observations that contain average monthly prices below 5 dollars and above 60 dollars. We chose these amounts based on the price distribution in our sample and following prices posted on the internet. When we dropped these observations, the number of games was reduced by 20 games down to 3365.

[13] See Table A3 for summary statistics of the sample of games dropped versus those games that we kept for the empirical analysis. In Figure A1, we plot game fixed effects for both subsets of games resulting from estimating the reduced-form demand equation together with platform-month-year and video game age fixed effects. Note that dropped games are on average of lower "quality" than the video games that we keep in the sample for our empirical analysis.

spite the fact that the games seem all to last the same in the market, around 25 months. Exclusive not-integrated games sell less units and collect lower monthly revenues despite charging the same prices than the average in the sample. We see as well that roughly 50% of observations are from games developer-publisher integrated, almost 10% of observations are from games published by a publisher owned by a platform and that 15% of the observations are from independent games that are exclusive to only one platform.

In Table 2 we break up the initial sample by platform. We show that, within the consoles in the 6th generation, PS2 released over 1,500 games within this period, XBOX close to 900 and GameCube over 500. For consoles in the 7th generation and up to October 2007, XBOX360 had released almost 200 games, compared to 130 for Wii and 80 for PS3. This table reports average and median monthly revenues by console. This allows us to see that the distribution of revenues are rather skewed and, for example, in the 6th generation, PS2 was the clear winner of all three consoles since PS2 had the most skewed distributions of the three consoles. Up to October 2007, it is difficult to say which of the three consoles in the 7th generation is and would be the winner since all three sets of statistics are quite similar, with a slight advantage to XBOX360.

More importantly for the purpose of this paper, Table 2 also describes how vertical integration patterns vary by console. Vertical integration seems to be more common among consoles in the 7th generation than those in the 6th generation. As consoles in the 7th generation were at the beginning of their run in our data set, this suggests that consoles rely more on vertical integration earlier than later in their run. Within the sixth generation, GameCube has the highest three-way integration average with a

4.3% of its observations, followed by PS2 and XBOX with 3.5% and 2.3% respectively. All three consoles have similar percentages around 40% and 45% of developer-publisher vertical integration. The early data for the 7th generation seems to tell a different story since PS3 is the console with the highest three-way integrated observations around 10%. Wii follows with 6.4% and XBOX360 has 5.6%. The range of developer-publisher game integration (non-including three-way integration) is also quite different from the one observed in the 6th generation. Here, the lowest average is Wii with 56% and the highest is PS3 with 68%. Finally, 62.4% of XBOX360 observations are due to games developed and published by the same firm.[14]

A key component of our data set is the fact that integration status of a video game varies along the life of a video game due to the fact that independent developers get acquired by publishers or merge with integrated developers during this time period. In total we observe 54 developer acquisitions during this period.[15] These 54 developers are responsible for 418 games during the whole period, but only 133 of these were developed prior to the acquisition. Of all these games, 73 games are sold (and therefore observed) before and after the change in ownership and therefore their observation allows us to infer

[14] See Tables A1 and A2 in the appendix for averages of integration by console and genre. Table A1 shows the number of monthly observations by console in the 6th generation (PS2, XBOX and GameCube), genre and vertical integration (whether the platform developed or published a game). This table shows that most genres are published or developed by all three platforms (except for minor genres). Table A2 shows percentages of vertically integrated games by genre. Overall, we do not observe drastic differences across platforms in genre offerings and vertical integration of games across genres and platforms. This evidence suggests that differences in performance between integrated and independent games will most probably not be strongly related to different propensities to vertically integrate in different genres across different platforms.

[15] In addition to these acquisitions, we encounter 3 more acquisitions that were dropped from the data and a merger between Namco and Bandai to form Namco Bandai in 2005. During this period of time, Left Field Productions was owned by Nintendo and it "bought out" its freedom in 2002.

the associated impact of changes in vertical integration on revenues holding constant all other game characteristics. Although most of these acquisitions happen for reasons not directly related to the characteristics of these video games,[16] we compare monthly unit sales, revenues and average prices of these 73 video games to other groups of video games in Table 3.

In particular, Table 3 compares averages of monthly unit sales, revenues and average montly prices between the target group of video games (73 video games) and four other groups: those games developed by acquired developers (Control Group 1, 133 games) prior to acquisition, all those video games developed by acquired developers (Control Group 2, 418 games), all video games developed by acquired developers and all vertically integrated games (Control Group 3, 1768 games), and finally all other video games (Control Group 4, 2953 games) in the data. Overall, this table shows that the Target Games group sells better (more units and higher revenues) than video games previously produced by the acquired developers and on average do worse or equivalent to all other control groups. When we focus on the first week of release, there are no statistically significant differences between the Target Games and Control Groups 2, 3 and 4. Finally, Target Games seem to do better than the average game (Control Group 4) during its first six months after release but not statistically different than vertically integrated games. Overall, Target games are selling at lower prices than games in other control groups regardless of the month since release.[17]

[16] Popular and industry press talk about hiring an upcoming programmer star in the industry or assuring future franchises of a game as some of the main reasons.

[17] In the appendix, we plot the distribution of game-specific fixed effects of the 73 games acquired against the sample of the dropped games (Figure A2) and the every control group specified in Table 3

# 5 Empirical Strategy and Results

We divide our empirical exploration in two different parts. The first part estimates cross-sectional differences between integrated and non-integrated games in our three performance measures (revenue, quantity and prices). The second part estimates the demand function of video games using a reduced form approach where market shares are being estimated as a function of price, number of months since release and the organizational form involved in the game development and distribution stage. Consumer demand is not per se affected by whether the video game is internal to a publisher or independent, but it is affected by unobserved heterogeneity correlated with organizational form that varies across games and within games across months. Our integration and exclusivity variables are informative to the extent that they pick up correlation of higher unobserved quality (higher demand) with organizational form of a video game.

## 5.1 Presenting Stylized Facts: Differences in Performance

As announced above, we have three measures of game performance through which we want to establish stylized facts in this industry. These are the logarithms of monthly revenues, unit sales and average price. We therefore start our analysis by running separate regressions for each one of the three performance measures such that,

$$\ln(y_{ipmy}) = \alpha_0 + \alpha_1 VertIntDP_{ipmy} + \alpha_2 VertIntPP_{ipmy} + \alpha_3 VertIntDPP +$$

(Figure A3). Table A4 presents summary statistics of each one of these four groups distributions such as mean, standard deviation, median and skewness.

$$+ \alpha_4 EXCLU_{ipmy} + \alpha_5 AGE_{ipmy} + \beta X_{ipmy} + \epsilon_{ipmy},$$

where $\ln(y_{ipmy})$ represents the performance measure at hand; $VertIntDP_{ipmy}$ takes value 1 if game $i$ is produced and published by the same firm but the publisher is not integrated with platform $p$, and 0 otherwise; $VertIntPP_{ipmy}$ takes value 1 if game $i$ is published by the same firm that owns platform $p$ but developed by another firm, and 0 otherwise; and finally $VertIntDPP_{ipmy}$ takes value 1 if game $i$ is produced and published by the same firm that owns platform $p$, and 0 otherwise. These three dummy variables are exclusive among each other. Other regressors in this descriptive analysis are $EXCLU_{ipmy}$ which takes value 1 if game $i$ is exclusive to platform $p$ and $AGE_{ipmy}$ which measures the number of months since game $i$ was released. The final regressor $X_{ipmy}$ is a vector containing various dummies of video game genre, age, platform and month-year fixed effects. We show results in Tables 4 to 6.

Table 4 presents the results using revenues as dependent variable. We start our empirical analysis by observing rough empirical correlations between monthly revenues and vertical integration and exclusivity variables. These correlations show that integrated games collect more revenues than independently developed and published games. Column (2) adds video game age (number of months since release) which turns to explain quite a lot of the variation in the dependent variable since the $R^2$ goes from 2% to 60%. Non-surprisingly, the older a game is the lower the amount of revenues that it collects. In the following four columns we include age, genre, month-year, platform and month/platform fixed effects to capture any component specific to these categories

that may be driving the observed differences in revenues. The results are robust to the inclusion of these fixed effects. Summarizing, we find that video games that are developer-publisher integrated and games that are published by a publisher that owns a platform collect higher revenues than the independent games in the sample. Additionally, we also find that video game exclusivity is negatively correlated with monthly revenues.

In Table 5, we use the monthly unit sales per video game as dependent variable. Similarly to Table 4, we find that vertically integrated games and games published by publishers than own platforms sell more units than independen games, even after including video game age, genre, month, platform and month/platform fixed effects. We also find games that are exclusive to a platform sell have lower monthly sales than non-exclusive independent games.

Finally, Table 6 offers results with average monthly prices (revenues divided by units sold) as dependent variable. Here we find that vertically integrated games sell at higher prices than independent games. Interestingly enough, we also find that exclusive independent games sell at higher prices than non-exclusive independent games.

In summary, these results show that there are differences in performance between integrated and independent games in our sample. In particular, we find that vertically integrated games collect higher revenues, sell more units and sell at higher prices than independent games. In addition to this, we found that exclusive independent games collect less revenues, sell less units but sell at higher prices than non-exclusive independent games. In the next section, we uncover what share of these cross-sectional differences are

due to differences in pricing and what share are due to differences in consumer demand that are correlated with video game quality and its organizational form.

### 5.2 Demand Estimation and Results

Once established that vertically integrated games perform better, we now turn to demand estimation to check that the results above survive the introduction of structure in the estimation. For this purpose, we estimate demand using a reduced form approach where we run OLS on the following regression equation,

$$\ln(s_{ipmy}) = \alpha_0 + \alpha_1 avg_p_{ipmy} + \gamma_1 VIDP + +\gamma_2 VIPP + \gamma_3 Genre_{ipmy} +$$

$$+ \sum_{j=1}^{85} \alpha_{2j} + \sum_{z=1}^{85} \alpha_{3z} + \sum_{j=1}^{85} \sum_{p=1}^{3} \alpha_{4jp} + \epsilon_{ipmy}.$$

In this specification, the dependent variable follows the analysis in Lee (2013) in that $s_{ipmy} = \frac{q_{ipmy}}{Q_{pmy} - Q_{ipmy}}$ where $q_{ipmy}$ is the number of units sold by game $i$ of platform $p$ in month $m$ of year $y$, $Q_{pmy}$ is the total number of platforms $p$ sold up to month $m$ of year $y$ and $Q_{ipmy}$ is the total number of units sold of game $i$ for platform $p$ before month $m$ of year $y$. Therefore, the dependent variable is the share of consumers at risk of buying game $i$ for platform $p$ that actually buy the game in month $m$ of year $y$. The right-hand side of this regression equation does not differ much than a typical demand equation. Since we do not observe individual transactions but rather aggregate revenues and unit sales per game, platform and month-year, we use the monthly average price per video game and platform $avg_p_{ipmy}$ as our price variable.

Then we add observable game characteristics such as genre and game-specific vertical relation controls that are our main variables of interest. These supply variables are $VIDP_{ipmy}$, $VIPP_{ipmy}$ and $EXCL_{ipmy}$. Let us now define each one of these variables: $VIDP_{ipmy}$ takes value 1 if game $i$ is distributed by a publisher integrated with its developer and 0 otherwise; $VIPP_{ipmy}$ takes value 1 if game $i$ is distributed by a publisher integrated with its platform but not with its developer and 0 otherwise; and finally $EXCL_{ipmy}$ takes value 1 if game $i$ is exclusive to platform $p$. Since we are after the estimation of $\gamma_2$, theoretically we do not care if price is endogenous as long as it does not affect the coefficients on the vertical control variables. Despite this, we understand that video game pricing is not exogenously determined and we know from the finding in Table 6 that vertically integrated games sell at higher prices. Therefore, prices are likely correlated with unobserved heterogeneity and our vertical control variables. For this reason, in our specifications we instrument price with the average number of months that takes a game's price to go down to 60% of its price at release for all other games in the same genre and platform within a year. This variable is positively correlated with observed average monthly prices and uncorrelated with game-specific monthly demand shocks and observed market shares since we are taking averages over all other games within a genre, platform and year.[18] After instrumenting, we start using game and month/year fixed effects and unbundle little by little the unobserved heterogeneity allowing us to observe

[18] We have also used other instruments for $avg_p_{ipmy}$. The first instrument follows Lee (2013) with lagged prices of a video game in a given platform. The second instrument that we use is the average price per game in that platform in that period for all games released in the same month as game $i$. These instruments do not seem to address the endogeneity problem and therefore we do not show those results here in this paper.

how organizational form may be correlated with vertical differentiation across games that ultimately drives demand up or down.

In addition to this, we control for game age (months since release) using dummy variables $\alpha_{2j}$ and month-year fixed effects $\alpha_{3z}$. Finally, we introduce month-year-platform fixed effects $\alpha_{4jp}$ to control for platform specific intertemporal substitution and platform specific time-varying advertising. Our specifications may also use other fixed effects at the platform or month level, but the set of fixed effects presented above will capture the unobservable seasonality and platform specific heterogeneity that the rest of controls cannot account for. We proceed next in Table 7 to show the results of estimating this demand equation.

Table 7 shows results of the empirical strategy above. Column (1) shows the raw correlation between average price and market share after controlling for age and month-year fixed effects. In column (2) we use game-platform fixed effects to control for all the unobserved heterogeneity hidden in the error term and correlated with pricing decisions. The price coefficient is now $-0.030$ which is larger than the coefficient in column (1) and statistically significant at 1% level. These two specifications also include age fixed effects and month-year fixed effects. Figure 2 plots age fixed effects and shows the remarkable linearity of the decay rate in our sample of video games.

In column (3) we instrument for price while using platform fixed effects. The price coefficient increases to $-0.246$ and is significant at 1% level. The magnitude of the price coefficient has increased because our instrument has relatively little variation across games within genre and platform and therefore this larger sensitivity of demand to price

changes is picking up sensitivity differences across genres and platforms. We proceed in columns (4) and (5) by adding to the specification our set of vertical relation variables (vertical integration and exclusivity) and eventually adding month/year/platform fixed effects in column (5). The last two specifications yield larger estimates of $\alpha$ (0.294 and 0.301 respectively) and provide similar results for the relation between our vertical control variables and demand. Results in column (5), our benchmark specification hereafter, show that vertical integration between developer and publisher is associated with 78 percentage points higher demand than independent games. We also find that independent games published by a publisher that owns a platform have higher sales than independent games published by publishers without a platform. Finally, we find that exclusive independent games do no worse than non-exclusive independent games despite the summary statistics reported earlier. Figure 3 plots game fixed effects and shows the distribution of independent games relative to all other groups of integrated games.

Once we have established that there exist differences in demand for games produced and marketed under organizational forms, we test for the origin of these differences. One may be concerned that our vertical control variables are correlated with unobserved variables that drive sales at the game-platform-month level (our observational unit) since the existing literature offers several instances that document so. Nair (2007) shows that ex-post release promotional activities and marketing strategies in the video game industry may increase demand. Ohashi (2005) shows evidence that publishers release their internally developed games further apart in time than they do with their independently developed games. Finally, it may be that integrated games are different in that their

design and development adjust better to market trends and platform capabilities. We explore the importance of these different factors for video game performance in the next section.

# 6 Exploring the Channels Behind the Effect of VI

Once established in the previous section that there is an empirical relation between vertical integration and video game demand, we proceed to consider what are the different sources of such empirical correlation. In summary, there are three stages in the life of a game through which vertical integration could play an important role in increasing value of a video game. These are the developing stage, the release stage, and the post-release stage. The result in the previous section could come from the fact that vertically integrated publishing companies do a better job at promoting their own games after release, do a better job at choosing the optimal time of release (by softening competition between their own games) or do a better job at developing games (or choosing what games to develop) in terms of design and matching with demand trends and platform capabilities as shown in our model in section 3. We next explore the role of these three potential explanations by directly investigating the role of the former two and interpreting the residual as supporting evidence for the latter.

Table 8 explores the relative importance of these explanations. Column (1) in Table 8 shows the same specification as column (5) in Table 7 and serves as a reference for the interpretation of results in columns (2) to (4). The specification in column (2) helps us disentangle the importance of post-release marketing strategies, whereas specifications

in columns (3) and (4) will provide a joint estimate of the role of post-release marketing strategies and ex-ante development.

To explore the relevance of post-release marketing strategies, we introduce game-platform fixed effects in column (2). By doing this, we are able to identify changes in demand that are contemporaneous to changes in the game's organizational form during the run of a game and after its release. We devoted great efforts to include all acquisitions and mergers during the span of time that our data spans. Therefore we are confident that after including game-platform fixed effects the changes in performance are due to changes in marketing strategies that occur after a change in organizational form after the release of the game and during its run. Since our instrument has limited variation at the platform-genre-year level, we run OLS regression in this specification confident that the game-platform and platform-month-year fixed effects capture all unobservable characteristics idiosyncratic to the game-platform level that may affect pricing.

We show the results of exploring this explanation in column (2) of Table 8. According to this specification, a game's demand is associated with an increase of 8 percentage points once the game becomes developer-publisher integrated but the coefficient is not statistically significant. This is consistent evidence with the fact that one of the benefits of integration in this industry comes from better marketing strategies even after the release period. On the other hand, exclusivity within the lifetime of a video game is again associated with lower demand.

We lack an instrument for organizational form and exogenous variation during the period of study and therefore it is difficult to assess how much of this result is due to

causality and how much to correlation. For example, the finding in column (2) may be easily discarded as endogenous as one may argue that acquiring publishers time their acquisitions with increases in demand of specific games developed by the acquired firms during the run of such games. If this seems reasonable in other settings studying the consequences of firm acquisitions, anecdotal evidence suggests that this is less likely to be the case in this particular setting for a number of reasons. First, our unit of observation in this paper is the video game. As explained in our institutional detail section, sales of video games start high and decrease at a steep rate thereafter dying quite fast. As we include game/platform and game age fixed effects, our result here are associated with a bump in demand that occurs after the acquisition takes place and for all games developed by the acquired firm (not just the hit game). Second, acquisitions in this industry are mainly done to acquire talent and insure ownership of future franchises of a hit game. Therefore, increases in demand of currently marketed games are uncorrelated with the goal of the acquisition itself. Despite these attenuating factors, acquisitions are still endogenous and therefore we rely on the assumption that demand for a video game involved in an acquisition does not change ex-post for reasons unrelated to the acquiring firm's actions such as anticipated game-specific seasonality.[19]

Another potential explanation for the impact of vertical integration on video game performance is that publishers coordinate better the release of their own games than the release of video game developed by others. Ohashi (2005) empirically examines how

[19] Table 3 compares video games that change ownership status during its run and all other vertically integrated games (Control Group 3).

release strategies differ for games when integrated. He finds that integrated games are released further apart in time relative to their non-integrated games.[20] In the case of the other words, publishers soften competition for their internally developed games more than they do for their independently developed games hoping to increase sales for their own vertically integrated games.

We explore the empirical relevance of this explanation by adapting our demand estimation methodology. Note that Lee (2013) and Nair (2007) assume that there is no substitution across games while focusing on the intertemporal substitution between platforms as a main deterrent of current game purchases. Evidence in Ohashi (2005) and Derdenger (2008) suggests otherwise, that is, that substitution across games must be considered when studying video game demand. For our purposes, vertical integration may play an important role if integrated publishers do better at softening competition for their own games than non-integrated publishers are.

To examine the relevance of this explanation, Ohashi (2005) measures the amount of competition that each game faces within its genre and across genres and empirically relates that to whether the game's publisher is integrated with its platform. Here, instead of creating competition variables that would account for softer competition of vertically integrated games, we introduce fixed effects that will implicitly play the same role. Using fixed effects allows us to add nonlinearities that otherwise would be ignored if we included a linear regressor. In particular, in column (3) of Table 8, we introduce

[20] Corts (2001) was the first to empirically show the difference in the timing of release due to vertical integration using the movie industry as his empirical setting.

platform/month/year/genre/age fixed effects. We can use this vast number of fixed effects because of the richness of variation in our dataset. Importantly this allows us to control for differences in game competition within genre and month of release. Any difference in performance between vertically integrated and independent games then must be due to differences in either game quality or advertising intensity. In column (4) we instrument the average price variable and obtain very similar results to those in column (3).

The results in these last two columns of Table 8 show that vertical integration is associated with 42 percentage points higher demand even after controlling for whether the game is published by a publisher that owns a platform and differences in genre and month of release competition. To make sense of these results we need to compare these results to those in columns (1) and (2) of Table 8. In column (1) of Table 8 the coefficient on $Dev - Pub\ Integration?$ is +0.784. This same coefficient in column (2) is +0.076. This means that there are 70 percentage points that are left unexplained and that could be due to better quality games or less competition faced by vertically integrated games. Column (4) in Table 8 yields a statistically significant coefficient of +0.419. The combination of the results in these two columns basically imply that better marketing strategies explain 8 extra percentage points in performance (although not statistically significant), that the "higher" quality of integrated games explains 34 extra percentage points in performance relative to independent games and that softening competition through coordinated release explains the remaining 37 percentage points in extra demand.

Note that games that are published by a publisher that owns a platform have higher demand than non-exclusive independent games and that exclusive independent games have lower demand than non-exclusive independent games of the same genre and released during the same month. In particular, games published by a platform publisher are associated with 140 extra percentage points in demand and exclusive independent games are associated with 60 percentage points less of demand.

The evidence from Table 8 shows that game quality selection, release month decisions, and ex-post promotional activities are plausible explanations for the total impact of vertical integration on video game performance. The question then is whether vertical integration has any effect into game development prior to release stage that translates into better performance along the life cycle of the game. We address this concern above when we talk about the residual impact of vertical integration on the quality of the games. Table 9 provides a summary of the impact of all three causal explanations of vertical integration on video game demand.

These results are, at least to us, interesting and open the question of why publishers and platforms integrate into development, and more so, why these acquire new developers if they could be publishing "better games"from their existing internal development units. A possible reason why we observe this correlation at the development stage is that developers and publishers incur lower adaptation costs once they become integrated. Another possibility could be that they achieve better coordination at the same cost or even that integrated publishers represent the result of a better (endogenous) match between publishers and developers within the same company than the match of independent

firms working together. It is possible that publishers acquire successful developers as a way to acquire and retain high talent and therefore increase their chances to design a hit game in the future as well as better evaluate products and talent elsewhere in the industry. Finally, a last potential explanation is that network effects matter much and that integrated publishers and platforms really care about the number of games they release every year since that will determine their bargaining position with platforms and determine the platform demand itself.

# 7 Conclusion

In this paper, we empirically examine the relation between vertical integration and video game performance in the United States. We do this in two significant ways. First we provide stylized facts regarding performance differences across games with different organizational forms. Second, we estimate video game demand and relate differences in video game demand due to differences in video game organizational form. Once this is done, we attempt to evaluate the origins of the impact of vertical integration on video game demand by differentiating three possible channels: better marketing strategies after the video game release and better timing of video game release strategies (value added provided by integrated firms) or inherently higher quality of video games (selection of video games into integrated firms).

Our results indicate that the superior performance of integrated games is mainly due to softer competition at release and inherently higher quality of video games. In particular, we find that post-release marketing strategies boost video game demand by

a maximum of 8 percentage points, while inherently higher game quality and softer competition at release to increase demand around 35 percentage points each. When relating these results to the literature on platform demand and exclusivity, we also found that video game exclusivity is negatively correlated with video game demand once we account for the existing vertical relations between developers, publishers and platforms.

These results are interesting and may have direct implications not only for understanding the role of vertical integration in innovation but also for research on management in innovative industries. Had network effects been absent, these findings seem to indicate that this industry would be less integrated and more atomized than it is currently. This is consistent with observed trends in other innovative industries where outsourcing innovation seems to be the way to conduct research and other uncertain process that may drive costs up.

Thus our research is also informative for current policy debates regarding platform regulation. These revolve around whether competition among platforms or monopoly will ensure the delivery of quality in these type of markets. Similarly, antitrust and merger policy that impacts the degree of competition on these industries feeds from research like ours where we document differences in performance across different types of organizational forms. Finally, our results are also informative of factors affecting productivity and optimal resource allocation for companies in this industry.

Despite the efforts in the current article, we leave many windows open to stir discussion and future research. For instance, we did not address the endogeneity of the vertical integration variable nor why we observe so many mergers, acquisitions and takeovers in

this industry during the 7 years that our data spans. In the future, we plan to examine this research question while relying in our current results to shed light more generally on what drives organizational form in innovative industries. The goal of this future research should be of interest not only to those interested in the video game industry and other innovative and creative industries, but also those interested in the management of innovation and the economics of contracts.

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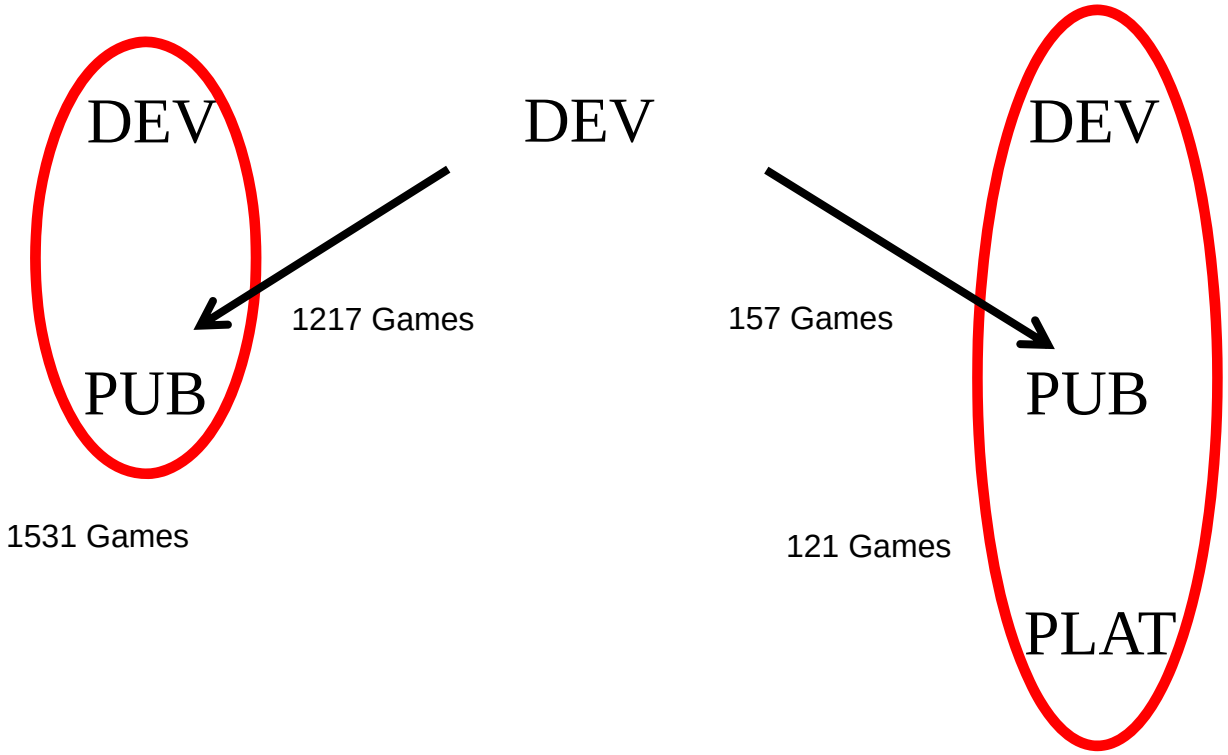
# Figure 1. Organization Structures

## Organization Structures of Games in Sample




## Organization Structures from Games Dropped from Sample

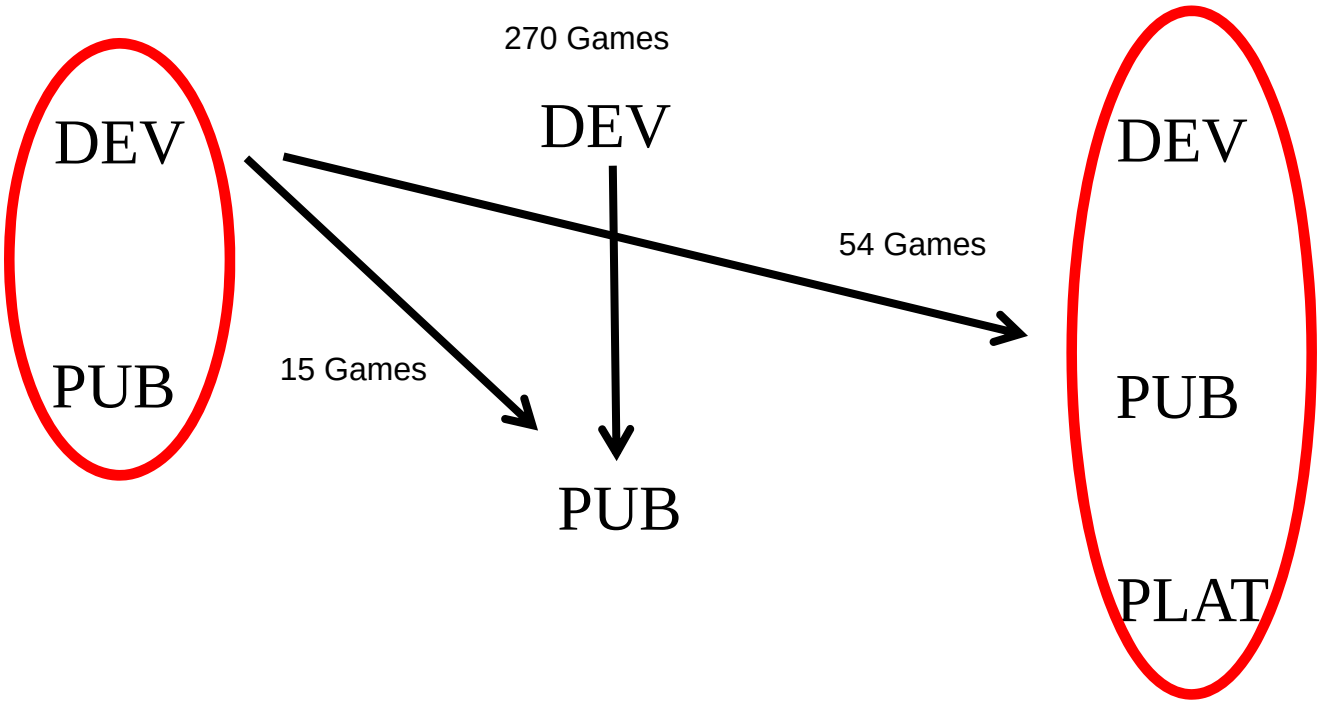


Figure 2. Month Since Release Fixed Effects

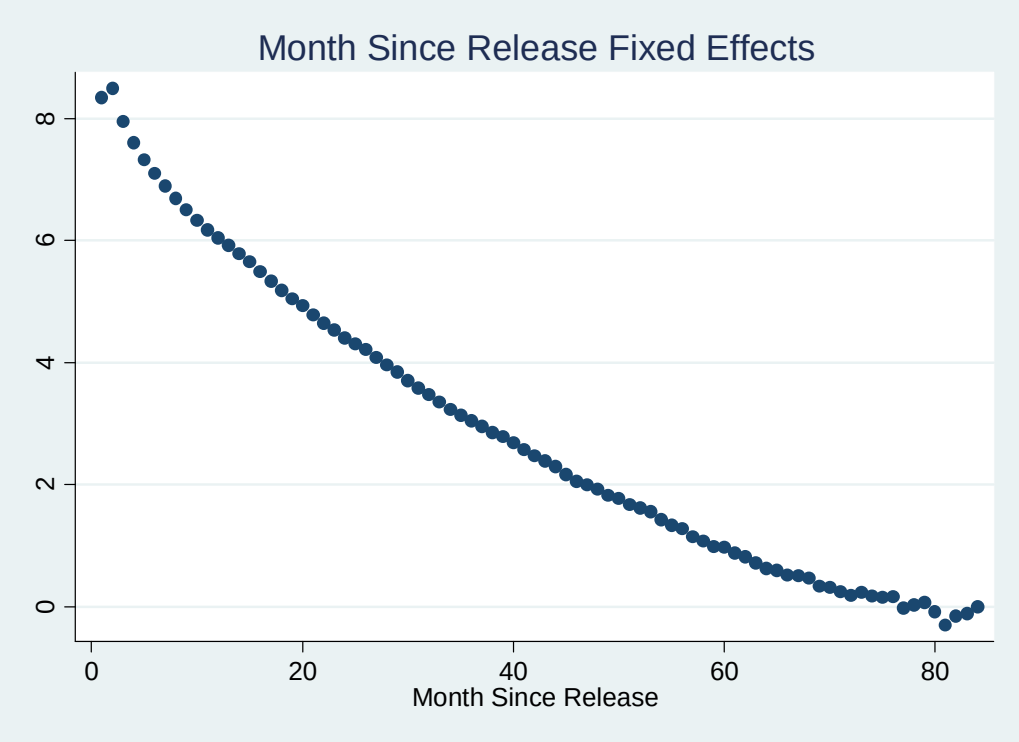



Figure 3. Game Fixed Effects by Integration Status

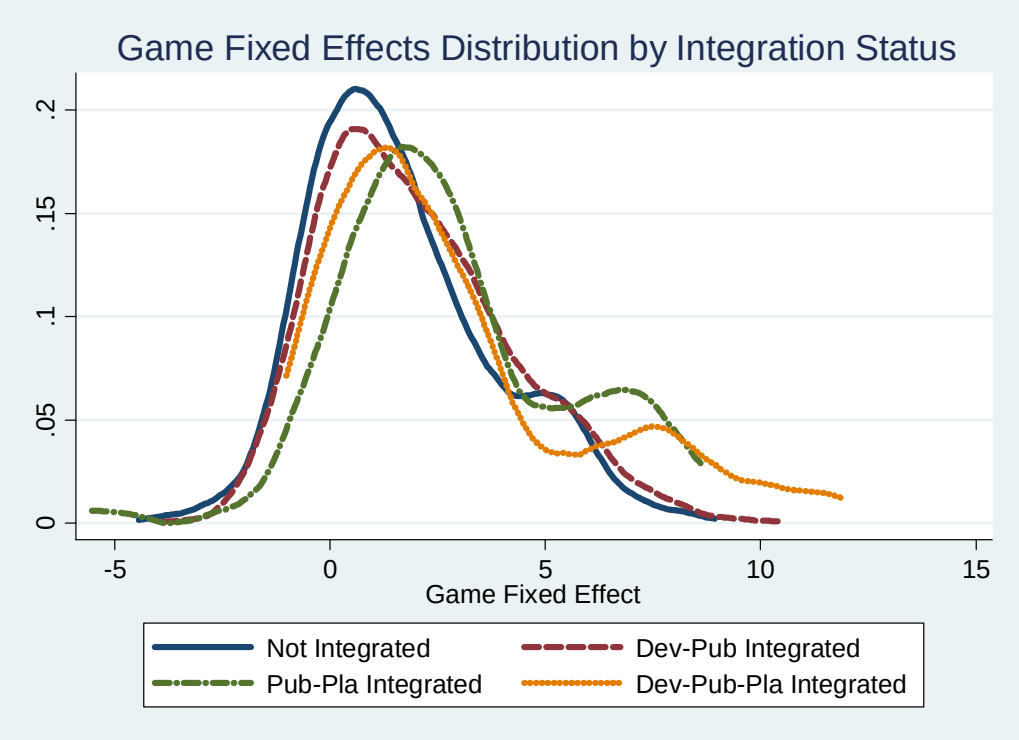


**Table 1. Summary Statistics for Performance Outcomes and Vertical Integration Variables**

| | All obs. | If Exclusive - Not Integ | If VertInt Dev-Pub | If VertInt Pub-Platf | If VertInt Dev-Pub-Platf |
|---|---|---|---|---|---|
| **Monthly Revenues** | 241076.4 | 145148.3 | 291664.8 | 409300.8 | 636984.3 |
| | (1516420) | (974812) | (1680413) | (1768800) | (3542998) |
| **Average Monthly Price** | 21.8 | 21.4 | 22.7 | 23.3 | 24.8 |
| | (11.6) | (11.1) | (12.2) | (12.7) | (13.4) |
| **Monthly Units Sold** | 6578.7 | 3987.6 | 7744.4 | 10978.1 | 15786.8 |
| | (31494.5) | (20302.0) | (35529.3) | (36592.5) | (67844.6) |
| **Age** | 23.8 | 25.1 | 23.6 | 25.7 | 24.9 |
| | (17.2) | (18.8) | (17.3) | (18.2) | (17.9) |
| **Obs** | 110,714 | 16,215 | 54,697 | 5,948 | 4,458 |

Note: This table provides summary statistics for three performance outcome variables, revenues, price and units sold for exclusive as well as vertically integrated games of different natures: developer-publisher integration, publisher-platform integration, and three-way integration. We use these to establish cross-sectional differences among games and to shed light on how vertical integration impacts game performance.

**Table 2. Summary Statistics by Platform**

| | PS2 | XBOX | GC | XBOX360 | WII | PS3 |
|---|---|---|---|---|---|---|
| **Number of Games** | 1,509 | 884 | 546 | 196 | 131 | 79 |
| **VertInt Dev-Pub?** | 43.60% | 41.80% | 46% | 62.40% | 56.10% | 68% |
| **VertInt Pub-Platf?** | 4.21% | 5.70% | 4.10% | 4.90% | 3.80% | 8.30% |
| **VertInt Dev-Pub-Platf?** | 3.50% | 2.30% | 4.30% | 5.60% | 6.40% | 10.20% |
| **Average Monthly Revenues** | $242,427 | $146,064 | $146,302 | $1,279,729 | $1,128,127 | $966,132 |
| **Median Monthly Revenues** | $9,457 | $8,026 | $7,351 | $246,662 | $281,610 | $382,909 |
| **Min Monthly Revenues** | $0 | $0 | $0 | $0 | $0 | $2,902 |
| **Max Monthly Revenues** | $100,879,300 | $87,669,040 | $40,956,360 | $141,363,100 | $25,502,900 | $20,031,190 |
| **Number Obs.** | 63,692 | 37,543 | 24,915 | 2,073 | 734 | 459 |

Note: This table provides summary statistics of most important variables. This is useful to present key differences across platforms in terms of number of games released, vertical integration patterns and average and median monthly revenues.

**Table 3. Summary Statistics of Video Games Acquired During its Lifetime**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | **Target Games** | **Control Group 1** | **Control Group 2** | **Control Group 3** | **Control Group 4** | **Diff (1)-(2)** | **Diff (1)-(3)** | **Diff (1)-(4)** | **Diff (1)-(5)** |
| ***All Periods*** | | | | | | | | | |
| **Monthly Revenues** | 224425.2 | 141909 | 335558.8 | 306490.8 | 241634.1 | 82515.99*** | -111133.6*** | -82065.56*** | -17208.9 |
| | (17532.45) | (8089.25) | (18464.32) | (7414.02) | (4673.31) | (16903.58) | (36409.15) | (31329.77) | (25736.43) |
| **Monthly Unit Sales** | 6976.369 | 4239.006 | 8876.385 | 8044.346 | 6565.378 | 2737.55*** | -1900.016*** | -1067.978* | -410.991 |
| | (454.90) | (182.99) | (359.35) | (152.43) | (96.63) | (414.81) | (725.92) | (647.55) | (534.52) |
| **Monthly Avg Price** | 19.98312 | 19.9036 | 22.2412 | 22.7004 | 21.815 | 0.0795 | -2.258*** | -2.717*** | -1.832*** |
| | (0.20) | (0.13) | (0.11) | (0.05) | (0.04) | (0.23) | (0.23) | (0.21) | (0.20) |
| ***First Month of Release*** | | | | | | | | | |
| **Monthly Revenues** | 2260766 | 1461982 | 2879002 | 2562888 | 2057934 | 798784.1* | -618236 | -302122 | 202832.3 |
| | (455345.70) | (189112.20) | (274966.80) | (128327.90) | (83795.22) | (422965.60) | (657036.10) | (619039.00) | (526835.60) |
| **Monthly Unit Sales** | 58225.37 | 31046.7 | 61300.13 | 54663.88 | 44999.8 | 26506.15*** | -3074.76 | 3561.49 | 13225.55 |
| | (11453.85) | (3881.05) | (5620.30) | (2623.95) | (1719.56) | (9773.48) | (13746.20) | (12734.47) | (10863.14) |
| **Monthly Avg Price** | 41.77194 | 44.837 | 44.9832 | 44.3423 | 41.9329 | -3.065** | -3.211** | -2.5703** | 0.1609 |
| | (1.31) | (0.71) | (0.50) | (0.23) | (0.21) | (1.37) | (1.28) | (1.15) | (1.30) |
| ***First Six Months After Release*** | | | | | | | | | |
| **Monthly Revenues** | 1010931 | 626669.9 | 1024946 | 1056775 | 830344.8 | 384260.9*** | -14015.3 | -45844.4 | 180586.1 |
| | (1010931.00) | (47876.30) | (55592.92) | (31043.38) | (19673.20) | (116625.30) | (132251.00) | (147071.30) | (121743.10) |
| **Monthly Unit Sales** | 27228.79 | 14483.79 | 23405.38 | 24063.74 | 19462.26 | 12745*** | 3823.414 | 3165.047 | 7766.53*** |
| | (2647.87) | (1007.80) | (1153.73) | (652.80) | (414.28) | (2388.39) | (2828.88) | (3108.87) | (2574.96) |
| **Monthly Avg Price** | 37.6669 | 37.5256 | 38.8432 | 39.2834 | 36.8858 | -0.1414 | -1.1761* | -1.6164*** | 0.7812 |
| | (0.59) | (0.39) | (0.25) | (0.11) | (0.10) | (0.68) | (0.61) | (0.55) | (0.58) |

Note: This table provides summary statistics for the group of video games (73) whose developer is acquired during their lifetime, we call this Target Games. We offer summary stats for four other groups and compare their stats with those of Target Games in columns 6 to 9. Control Group 1 are those games developed by acquired developers before the acquisition takes place. Control Group 2 includes Control Group 1 and those video games developed by the developer after being acquired. Control Group 3 includes control Control Group 2 and all video games that are vertically integrated since inception. Finally, Control Group 4 includes all video games.

**Table 4. Empirical Relation Between Vertical Integration and Monthly Video Game Revenues**

| **Dep Var: log(revenue)** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
|---|---|---|---|---|---|---|---|
| **VertInt Dev-Pub** | 0.404*** | 0.399*** | 0.384*** | 0.475*** | 0.468*** | 0.443*** | 0.444*** |
| | (0.048) | (0.031) | (0.030) | (0.031) | (0.031) | (0.030) | (0.030) |
| **VertInt Pub-Platform** | 1.182*** | 1.283*** | 1.313*** | 1.400*** | 1.405*** | 1.482*** | 1.484*** |
| | (0.112) | (0.072) | (0.070) | (0.069) | (0.069) | (0.069) | (0.069) |
| **VertInt Dev-Pub-Platform** | 1.498*** | 1.497*** | 1.535*** | 1.689*** | 1.701*** | 1.763*** | 1.763*** |
| | (0.133) | (0.097) | (0.095) | (0.090) | (0.089) | (0.093) | (0.093) |
| **Exclusivity** | -0.206*** | 0.026 | -0.081** | -0.146*** | -0.207*** | -0.383*** | -0.380*** |
| | (0.051) | (0.033) | (0.032) | (0.032) | (0.032) | (0.034) | (0.034) |
| **Age** | | -0.120*** | | | | | |
| | | (0.001) | | | | | |
| **Constant** | 9.157*** | 11.903*** | 9.107*** | 7.347*** | 8.214*** | 7.702*** | 8.073*** |
| | (0.038) | (0.031) | (0.025) | (0.144) | (0.159) | (0.162) | (0.160) |
| **Age FE** | No | No | Yes | Yes | Yes | Yes | Yes |
| **Genre FE** | No | No | No | Yes | Yes | Yes | Yes |
| **Month-Year FE** | No | No | No | No | Yes | Yes | No |
| **Platform FE** | No | No | No | No | No | Yes | No |
| **Platform-Month-Year FE** | No | No | No | No | No | No | Yes |
| **Observations** | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 |
| **R-squared** | 0.02 | 0.61 | 0.64 | 0.67 | 0.68 | 0.69 | 0.70 |

Robust standard errors in parentheses and clustered at the game-platform-year level.
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 5. Empirical Relation Between Vertical Integration and Monthly Video Game Sales**

| **Dep Var: log(quantity)** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
|---|---|---|---|---|---|---|---|
| **VertInt Dev-Pub** | 0.314*** | 0.310*** | 0.299*** | 0.383*** | 0.381*** | 0.361*** | 0.362*** |
| | (0.044) | (0.030) | (0.029) | (0.030) | (0.030) | (0.030) | (0.030) |
| **VertInt Pub-Platform** | 1.159*** | 1.246*** | 1.267*** | 1.354*** | 1.355*** | 1.423*** | 1.426*** |
| | (0.099) | (0.068) | (0.067) | (0.066) | (0.066) | (0.067) | (0.067) |
| **VertInt Dev-Pub-Platform** | 1.418*** | 1.418*** | 1.445*** | 1.567*** | 1.576*** | 1.640*** | 1.639*** |
| | (0.115) | (0.089) | (0.088) | (0.085) | (0.084) | (0.088) | (0.088) |
| **Exclusivity** | -0.330*** | -0.132*** | -0.207*** | -0.239*** | -0.273*** | -0.431*** | -0.426*** |
| | (0.046) | (0.032) | (0.031) | (0.031) | (0.032) | (0.033) | (0.034) |
| **Age** | | -0.102*** | | | | | |
| | | (0.001) | | | | | |
| **Constant** | 6.304*** | 8.650*** | 6.253*** | 3.671*** | 4.453*** | 3.963*** | 4.334*** |
| | (0.035) | (0.029) | (0.024) | (0.141) | (0.156) | (0.160) | (0.158) |
| **Age FE** | No | No | Yes | Yes | Yes | Yes | Yes |
| **Genre FE** | No | No | No | Yes | Yes | Yes | Yes |
| **Month-Year FE** | No | No | No | No | Yes | Yes | No |
| **Platform FE** | No | No | No | No | No | Yes | No |
| **Platform-Month-Year FE** | No | No | No | No | No | No | Yes |
| **Observations** | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 |
| **R-squared** | 0.02 | 0.55 | 0.57 | 0.60 | 0.62 | 0.63 | 0.64 |

Robust standard errors in parentheses and clustered at the game-platform-year level.
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 6. Empirical Relation Between Vertical Integration and Average Monthly Video Game Price**

**Dep Var: log(average price)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **VertInt Dev-Pub** | 0.089*** | 0.089*** | 0.084*** | 0.092*** | 0.088*** | 0.082*** | 0.082*** |
| | (0.008) | (0.007) | (0.006) | (0.006) | (0.006) | (0.006) | (0.006) |
| **VertInt Pub-Platform** | 0.023 | 0.038** | 0.046*** | 0.046*** | 0.051*** | 0.060*** | 0.058*** |
| | (0.020) | (0.015) | (0.014) | (0.013) | (0.013) | (0.013) | (0.013) |
| **VertInt Dev-Pub-Platform** | 0.080*** | 0.080*** | 0.090*** | 0.121*** | 0.126*** | 0.124*** | 0.124*** |
| | (0.025) | (0.018) | (0.017) | (0.016) | (0.015) | (0.015) | (0.015) |
| **Exclusivity** | 0.124*** | 0.158*** | 0.126*** | 0.093*** | 0.066*** | 0.048*** | 0.046*** |
| | (0.009) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| **Age** | | -0.017*** | | | | | |
| | | (0.001) | | | | | |
| **Constant** | 2.853*** | 3.253*** | 2.854*** | 3.677*** | 3.761*** | 3.740*** | 3.739*** |
| | (0.007) | (0.007) | (0.005) | (0.033) | (0.035) | (0.036) | (0.036) |
| **Age FE** | No | No | Yes | Yes | Yes | Yes | Yes |
| **Genre FE** | No | No | No | Yes | Yes | Yes | Yes |
| **Month-Year FE** | No | No | No | No | Yes | Yes | No |
| **Platform FE** | No | No | No | No | No | Yes | No |
| **Platform-Month-Year FE** | No | No | No | No | No | No | Yes |
| **Observations** | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 | 110,714 |
| **R-squared** | 0.02 | 0.39 | 0.50 | 0.53 | 0.55 | 0.56 | 0.57 |

Robust standard errors in parentheses and clustered at the game-platform-year level.
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 7. Video Game Demand Estimation Accounting for Vertical Integration Characteristics**

| **Dep Var: log(Share)** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
|---|---|---|---|---|---|
| | **OLS** | **OLS** | **2SLS** | **2SLS** | **2SLS** |
| **Average Price** | -0.001 | -0.030*** | -0.246*** | -0.294*** | -0.301*** |
| | (0.002) | (0.001) | (0.056) | (0.066) | (0.068) |
| **Dev-Pub Integration?** | | | | 0.776*** | 0.784*** |
| | | | | (0.118) | (0.121) |
| **Pub Owns Platform?** | | | | 1.786*** | 1.794*** |
| | | | | (0.140) | (0.142) |
| **Exclusivity** | | | | 0.018 | 0.012 |
| | | | | (0.095) | (0.095) |
| **Constant** | -11.229*** | -10.172*** | 6.642** | 9.163** | 9.194** |
| | (0.091) | (0.460) | (3.163) | (3.715) | (3.791) |
| **Age FE** | Yes | Yes | Yes | Yes | Yes |
| **Month-Year FE** | Yes | Yes | Yes | Yes | No |
| **Game-Platform FE** | No | Yes | No | No | No |
| **Platform FE** | No | No | Yes | Yes | No |
| **Platform-Month-Year FE** | No | No | No | No | Yes |
| **Observations** | 110,436 | 110,436 | 105,827 | 105,827 | 105,827 |
| **R-squared** | 0.61 | 0.90 | 0.15 | 0.01 | 0.003 |

Robust standard errors in parentheses and clustered at the game-platform-year level.
The instrument used for average price is the average time in months to decrease to 60% of maximum price by platform and genre. * significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 8. The Impact of Vertical Integration on Video Game Demand: Development versus Marketing**

| **Dep Var: log(Share)** | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| | **2SLS** | **OLS** | **OLS** | **2SLS** |
| **Average Price** | -0.301*** | -0.032*** | -0.012*** | -0.011*** |
| | (0.068) | (0.001) | (0.004) | (0.002) |
| **Dev-Pub Integration?** | 0.784*** | 0.076 | 0.406*** | 0.419*** |
| | (0.121) | (0.070) | (0.071) | (0.040) |
| **Pub Owns Platform?** | 1.794*** | | 1.397*** | 1.432*** |
| | (0.142) | | (0.147) | (0.082) |
| **Exclusivity** | 0.012 | -0.126*** | -0.585*** | -0.597*** |
| | (0.095) | (0.028) | (0.085) | (0.047) |
| **Constant** | 9.194** | -10.021*** | -8.549*** | 0.0145* |
| | (3.791) | (0.592) | (0.106) | (0.008) |
| **Age FE** | Yes | Yes | No | No |
| **Platform-Month-Year FE** | Yes | Yes | No | No |
| **Game-Platform FE** | No | Yes | No | No |
| **Platform-Month-Year-Genre-Age FE** | No | No | Yes | Yes |
| **Observations** | 105,827 | 110,436 | 110,436 | 105,827 |
| **R-squared** | 0.003 | 0.91 | 0.91 | 0.08 |

Robust standard errors in parentheses and clustered at the game-platform-year level.
The instrument used for average price in 2SLS regressions is the average time in months to decrease to 60% of maximum price by platform and genre. * significant at 10%; ** significant at 5%; *** significant at 1%.

**Table 9. Exploring the Causal Effect of Vertical Integration on Video Game Demand**

| | (1) Joint Effect Column (1) Table 7 | (2) Post-Release Mktg Strategies Effect Column (2) Table 7 | (3) Mktg Strategies + Quality Effect Column (4) Table 7 | (4) Net Quality Effect (3)-(2) | (5) Net Release Period Effect (1)-(3) |
|---|---|---|---|---|---|
| **Dev-Pub Integration?** | **0.784**<br>**0.121** | 0.076<br>0.070 | **0.419**<br>**0.040** | **0.343**<br>**0.081** | **0.365**<br>**0.127** |
| **Exclusivity** | 0.012<br>0.095 | **-0.126**<br>**0.028** | **-0.597**<br>**0.047** | **-0.471**<br>**0.055** | **0.609**<br>**0.106** |

Note: Top number is coefficient and % impact on market share. Bottom number is standard errors. Significant coefficients appear in bold.
†Note that we cannot disentangle the effect of marketing strategies and quality effect because we do not recover coefficient in column (2).

Figure A1. Game Fixed Effects Distribution of Dropped Games

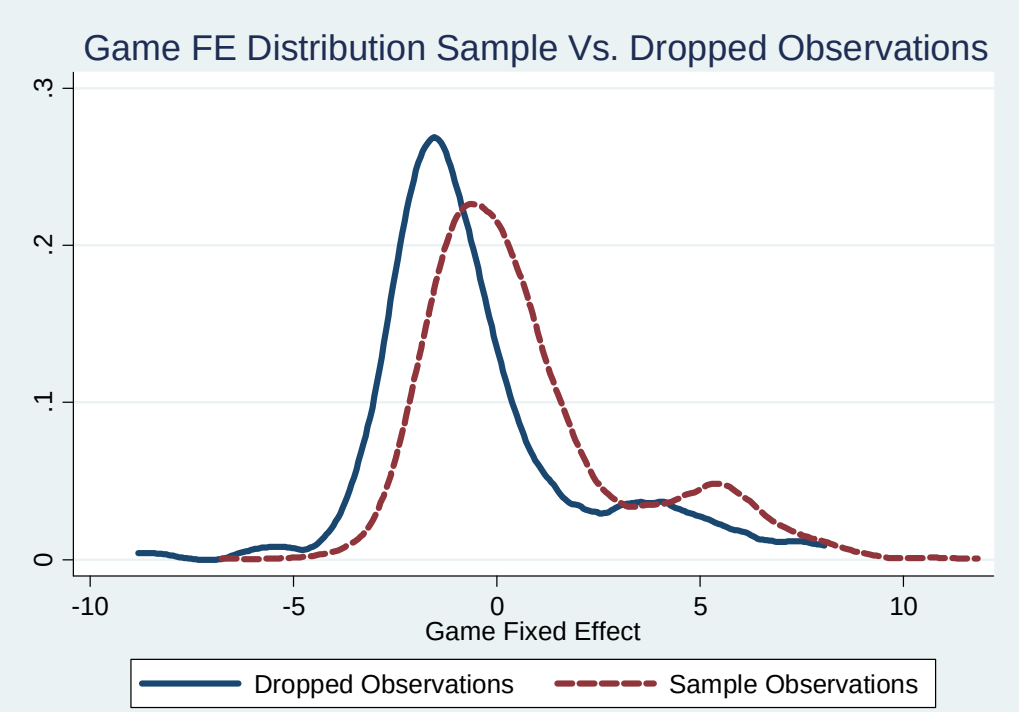



Figure A2. Are Acquired Games and Dropped Games Different?

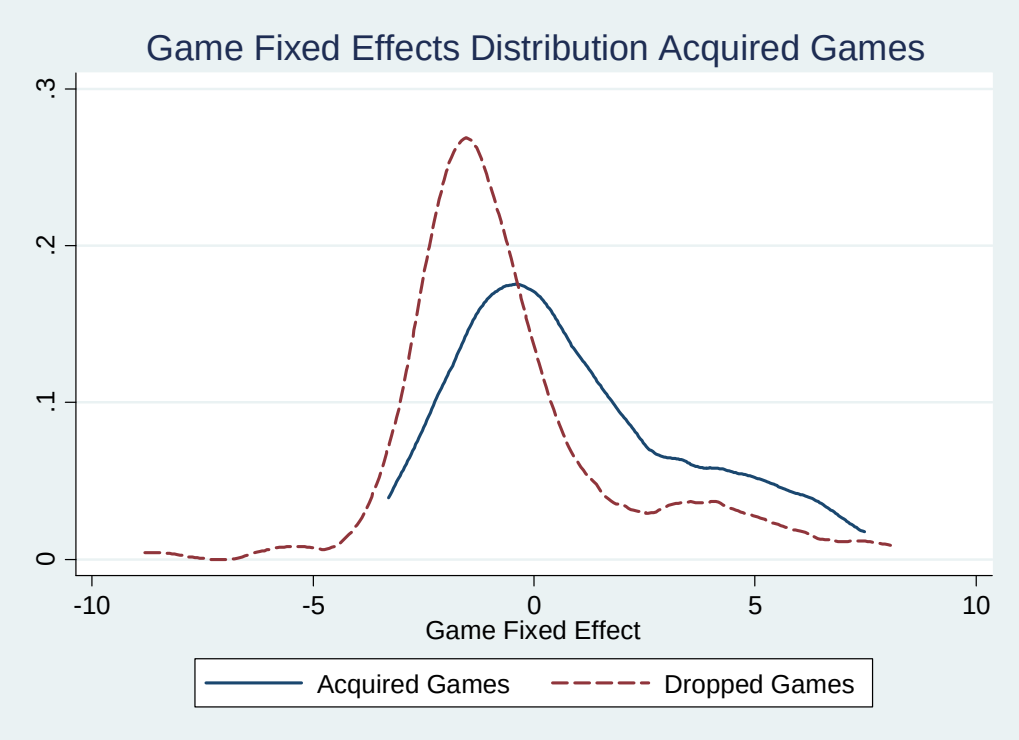


Figure A3. Plotting Distribution of Acquired Games Relative to Others

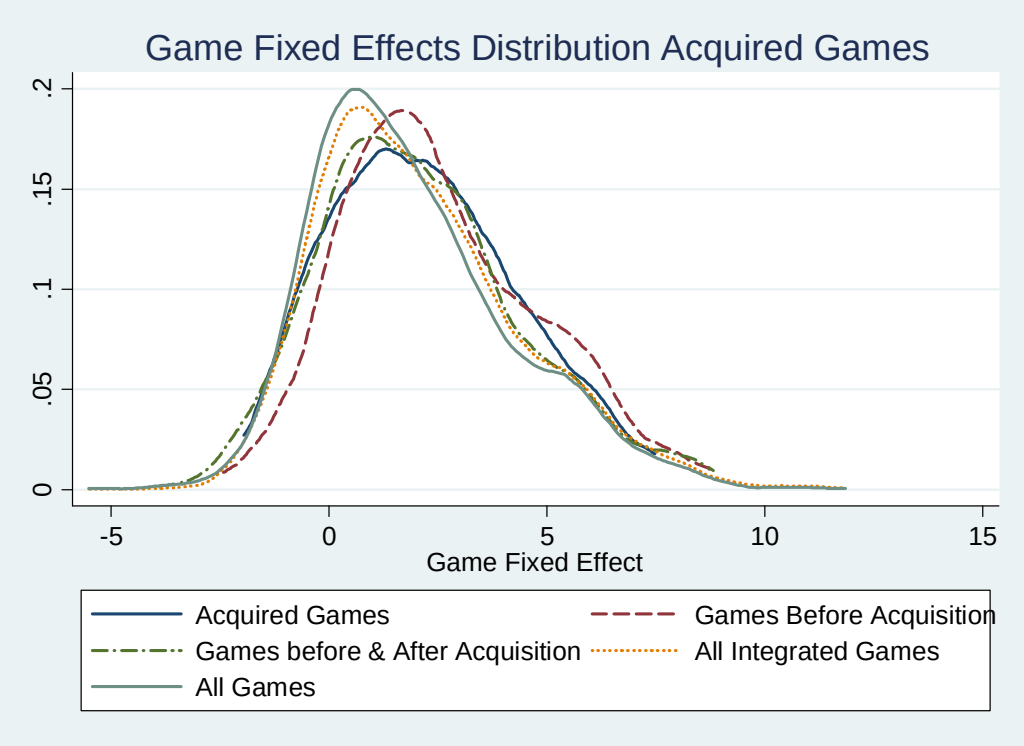



Figure A4. Dropped Games & Games By Integration Status

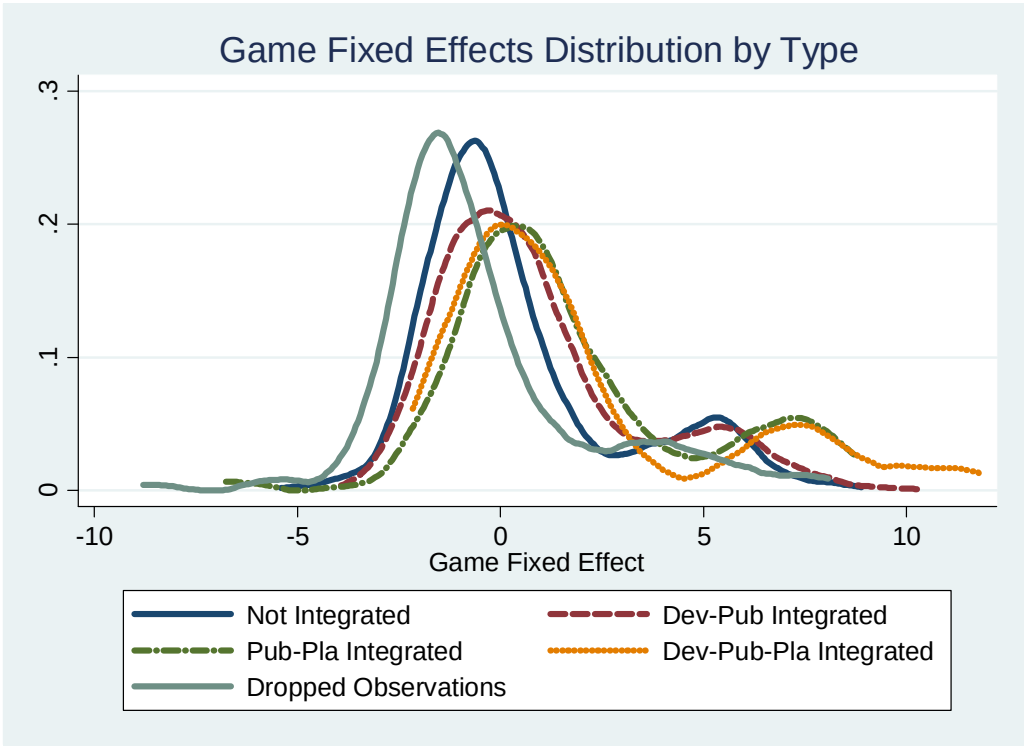


Table A1. Distribution of Games by Genre, Platform and Vertical Integration

| | Playstation 2 | | | XBOX | | | Gamecube | | |
|---|---|---|---|---|---|---|---|---|---|
| Genre | VI=0 | VI=1 | Total | VI=0 | VI=1 | Total | VI=0 | VI=1 | Total |
| 1ST PERSON SHOOTER | 999 | 1,090 | 2,089 | 1,268 | 930 | 2,198 | 346 | 523 | 869 |
| ACTION ORIENTED RACIN | 2,419 | 1,846 | 4,265 | 1,639 | 1,153 | 2,792 | 790 | 801 | 1,591 |
| ACTION/DRIVING HYBRID | 50 | 501 | 551 | 50 | 304 | 354 | 50 | 72 | 122 |
| ADULT | 107 | 0 | 107 | 37 | 34 | 71 | | | |
| AIR COMBAT SIMULATION | 185 | 302 | 487 | 133 | 125 | 258 | 53 | 61 | 114 |
| BASEBALL | 236 | 926 | 1,162 | 172 | 688 | 860 | 89 | 385 | 474 |
| BASKETBALL | 378 | 1,479 | 1,857 | 362 | 912 | 1,274 | 276 | 355 | 631 |
| BILLIARDS/POOL | 121 | 0 | 121 | 49 | 0 | 49 | | | |
| BOWLING | 18 | 0 | 18 | 15 | 47 | 62 | | | |
| BOXING | 222 | 244 | 466 | 215 | 96 | 311 | 58 | 32 | 90 |
| BUNDLES/COMPILATIONS | 54 | 0 | 54 | 37 | 51 | 88 | | | |
| CARD GAMES | 36 | 56 | 92 | 37 | 43 | 80 | 0 | 92 | 92 |
| CASINO GAMES | 115 | 0 | 115 | 98 | 36 | 134 | | | |
| CHILDREN'S GAMES | 448 | 337 | 785 | 117 | 84 | 201 | 366 | 365 | 731 |
| CLASSIC ARCADE | 414 | 48 | 462 | 210 | 87 | 297 | 251 | 25 | 276 |
| COMBAT RACING | 518 | 353 | 871 | 408 | 422 | 830 | 261 | 210 | 471 |
| EXTREME SPORTS | 872 | 1,393 | 2,265 | 619 | 1,025 | 1,644 | 480 | 686 | 1,166 |
| FIGHT/HEAD TO HEAD | 1,151 | 1,202 | 2,353 | 831 | 543 | 1,374 | 470 | 327 | 797 |
| FISHING | 151 | 140 | 291 | 0 | 75 | 75 | 25 | 0 | 25 |
| FOOTBALL | 481 | 1,345 | 1,826 | 107 | 1,188 | 1,295 | 0 | 874 | 874 |
| GENERAL ACTION | 3,828 | 4,210 | 8,038 | 2,608 | 2,458 | 5,066 | 1,450 | 1,809 | 3,259 |
| GENERAL ADVENTURE | 776 | 777 | 1,553 | 636 | 381 | 1,017 | 558 | 237 | 795 |
| GOLF | 162 | 310 | 472 | 29 | 235 | 264 | 52 | 175 | 227 |
| HOCKEY | 250 | 573 | 823 | 183 | 436 | 619 | 121 | 288 | 409 |
| HUNTING | 330 | 0 | 330 | 89 | 0 | 89 | 82 | 0 | 82 |
| LIFE SIMULATIONS | 157 | 352 | 509 | 183 | 164 | 347 | 65 | 267 | 332 |
| MECHANIZED SHOOTER | 595 | 331 | 926 | 464 | 45 | 509 | 60 | 42 | 102 |
| MMORPG | 12 | 142 | 154 | | | | | | |
| MULTIPLE/OTHER SPORTS | 185 | 442 | 627 | 78 | 196 | 274 | 62 | 165 | 227 |
| MUSIC/DANCE GAMES | 720 | 476 | 1,196 | 193 | 156 | 349 | 122 | 119 | 241 |
| OTHER GAMES | 0 | 32 | 32 | 0 | 37 | 37 | | | |
| OTHER SHOOTER | 482 | 651 | 1,133 | 330 | 105 | 435 | 43 | 0 | 43 |
| OTHER STRATEGY | 220 | 529 | 749 | 88 | 28 | 116 | 113 | 0 | 113 |
| PARTY GAMES | 156 | 168 | 324 | 121 | 114 | 235 | 357 | 203 | 560 |
| PINBALL | 64 | 0 | 64 | 71 | 0 | 71 | 51 | 0 | 51 |
| PLATFORM/SCROLLING CH | 1,982 | 1,475 | 3,457 | 1,215 | 720 | 1,935 | 1,337 | 1,268 | 2,605 |
| PUZZLE GAMES | 410 | 168 | 578 | 131 | 85 | 216 | 263 | 38 | 301 |
| QUIZ/GAME SHOW GAMES | 134 | 27 | 161 | 0 | 25 | 25 | | | |
| REAL-TIME STRATEGY | 125 | 119 | 244 | 197 | 73 | 270 | 36 | 152 | 188 |
| RPG | 1,735 | 1,839 | 3,574 | 568 | 547 | 1,115 | 451 | 689 | 1,140 |
| SOCCER | 48 | 974 | 1,022 | 115 | 435 | 550 | 113 | 560 | 673 |
| SPACE COMBAT SIMULATI | 216 | 181 | 397 | 189 | 152 | 341 | 179 | 0 | 179 |
| SPORTS ORIENTED RACIN | 750 | 1,274 | 2,024 | 503 | 552 | 1,055 | 189 | 347 | 536 |
| SQUAD BASED COMBAT | 523 | 327 | 850 | 467 | 359 | 826 | 101 | 185 | 286 |
| STEALTH ACTION | 281 | 595 | 876 | 149 | 404 | 553 | 164 | 135 | 299 |
| SURVIVAL HORROR | 401 | 942 | 1,343 | 247 | 324 | 571 | 16 | 325 | 341 |
| TENNIS | 45 | 223 | 268 | 51 | 36 | 87 | 36 | 27 | 63 |
| TRADITIONAL BOARD GAM | 143 | 90 | 233 | 44 | 36 | 80 | | | |
| WRESTLING | 470 | 167 | 637 | 284 | 165 | 449 | 288 | 121 | 409 |
| Total | 24,175 | 28,656 | 52,831 | 15,637 | 16,111 | 31,748 | 9,824 | 11,960 | 21,784 |
| | | 54.24% | | | 50.75% | | | 54.90% | |

Table A2: Percentage of Vertically Integrated Games by Platform

| Genre | PS2 | XBOX | Gamecube |
|---|---|---|---|
| 1ST PERSON SHOOTER | 52.18% | 42.31% | 60.18% |
| ACTION ORIENTED RACIN | 43.28% | 41.30% | 50.35% |
| ACTION/DRIVING HYBRID | 90.93% | 85.88% | 59.02% |
| ADULT | 0.00% | 47.89% | |
| AIR COMBAT SIMULATION | 62.01% | 48.45% | 53.51% |
| BASEBALL | 79.69% | 80.00% | 81.22% |
| BASKETBALL | 79.64% | 71.59% | 56.26% |
| BILLIARDS/POOL | 0.00% | 0.00% | |
| BOWLING | 0.00% | 75.81% | |
| BOXING | 52.36% | 30.87% | 35.56% |
| BUNDLES/COMPILATIONS | 0.00% | 57.95% | |
| CARD GAMES | 60.87% | 53.75% | 100.00% |
| CASINO GAMES | 0.00% | 26.87% | |
| CHILDREN'S GAMES | 42.93% | 41.79% | 49.93% |
| CLASSIC ARCADE | 10.39% | 29.29% | 9.06% |
| COMBAT RACING | 40.53% | 50.84% | 44.59% |
| EXTREME SPORTS | 61.50% | 62.35% | 58.83% |
| FIGHT/HEAD TO HEAD | 51.08% | 39.52% | 41.03% |
| FISHING | 48.11% | 100.00% | 0.00% |
| FOOTBALL | 73.66% | 91.74% | 100.00% |
| GENERAL ACTION | 52.38% | 48.52% | 55.51% |
| GENERAL ADVENTURE | 50.03% | 37.46% | 29.81% |
| GOLF | 65.68% | 89.02% | 77.09% |
| HOCKEY | 69.62% | 70.44% | 70.42% |
| HUNTING | 0.00% | 0.00% | 0.00% |
| LIFE SIMULATIONS | 69.16% | 47.26% | 80.42% |
| MECHANIZED SHOOTER | 35.75% | 8.84% | 41.18% |
| MMORPG | 92.21% | | |
| MULTIPLE/OTHER SPORTS | 70.49% | 71.53% | 72.69% |
| MUSIC/DANCE GAMES | 39.80% | 44.70% | 49.38% |
| OTHER GAMES | 100.00% | 100.00% | |
| OTHER SHOOTER | 57.46% | 24.14% | 0.00% |
| OTHER STRATEGY | 70.63% | 24.14% | 0.00% |
| PARTY GAMES | 51.85% | 48.51% | 36.25% |
| PINBALL | 0.00% | 0.00% | 0.00% |
| PLATFORM/SCROLLING CH | 42.67% | 37.21% | 48.68% |
| PUZZLE GAMES | 29.07% | 39.35% | 12.62% |
| QUIZ/GAME SHOW GAMES | 16.77% | 100.00% | |
| REAL-TIME STRATEGY | 48.77% | 27.04% | 80.85% |
| RPG | 51.45% | 49.06% | 60.44% |
| SOCCER | 95.30% | 79.09% | 83.21% |
| SPACE COMBAT SIMULATI | 45.59% | 44.57% | 0.00% |
| SPORTS ORIENTED RACIN | 62.94% | 52.32% | 64.74% |
| SQUAD BASED COMBAT | 38.47% | 43.46% | 64.69% |
| STEALTH ACTION | 67.92% | 73.06% | 45.15% |
| SURVIVAL HORROR | 70.14% | 56.74% | 95.31% |
| TENNIS | 83.21% | 41.38% | 42.86% |
| TRADITIONAL BOARD GAM | 38.63% | 45.00% | |
| WRESTLING | 26.22% | 36.75% | 29.58% |
| Total | 54.24% | 50.75% | 54.90% |

**Table A3. Summary Statistics of Dropped Games Relative to Sample Games**

| Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| **Dropped Observations (11355 obs)** | | | | |
| **Monthly Revenues** | 83366.02 | 392396.6 | 11 | 14800000 |
| **Monthly Units Sold** | 2606.0 | 8776.2 | 1 | 247534 |
| **Average Monthly Price** | 21.4 | 10.9 | 5 | 59.9 |
| **Age** | 23.2 | 17.3 | 0 | 84 |
| **Observations Used in the Paper (110714)** | | | | |
| **Monthly Revenues** | 241076.4 | 1516420 | 5 | 141000000 |
| **Monthly Units Sold** | 6578.697 | 31494.52 | 1 | 2367795 |
| **Average Monthly Price** | 21.8 | 11.6 | 5 | 60.0 |
| **Age** | 23.8 | 17.2 | -1 | 84 |

This table provides summary statistics for all games/obs that we dropped from the initial sample.

**Table A4. Distribution Statistics of Acquired Games and Alternative Control Groups**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | **Target Games** | **Control Group 1** | **Control Group 2** | **Control Group 3** | **Control Group 4** |
| **Monthly Revenues** | | | | | |
| Mean | 224425 | 142894 | 314338 | 300798 | 6186 |
| Std Dev | 1050193 | 670069 | 2025204 | 1837269 | 30218 |
| 1% | 41 | 42 | 62 | 43 | 4 |
| 5% | 114 | 167 | 250 | 152 | 10 |
| 10% | 229 | 337 | 529 | 352 | 22 |
| 25% | 956 | 1366 | 2321 | 1738 | 103 |
| 50% | 6633 | 9201 | 19553 | 14611 | 675 |
| 75% | 63501 | 61600 | 137556 | 115903 | 3639 |
| 90% | 403604 | 265560 | 543351 | 489474 | 12469 |
| 95% | 991940 | 604473 | 1213366 | 1095842 | 24078 |
| 99% | 4065840 | 2228095 | 4813310 | 4871831 | 88880 |
| Skewness | 11.62 | 16.08 | 38.03 | 27.45 | 26.59 |
| **Monthly Unit Sales** | | | | | |
| Mean | 6976 | 4250 | 8348 | 7907 | 226466 |
| Std Dev | 27249 | 15121 | 39444 | 37780 | 1460243 |
| 1% | 4 | 4 | 5 | 4 | 42 |
| 5% | 10 | 12 | 18 | 11 | 148 |
| 10% | 18 | 24 | 38 | 24 | 332 |
| 25% | 68 | 93 | 164 | 112 | 1576 |
| 50% | 442 | 579 | 1146 | 811 | 11730 |
| 75% | 3086 | 2976 | 5448 | 4646 | 85046 |
| 90% | 14737 | 8988 | 17323 | 15904 | 367943 |
| 95% | 31427 | 17953 | 33461 | 30807 | 807214 |
| 99% | 125195 | 60609 | 113019 | 113897 | 3734113 |
| Skewness | 9.42 | 13.29 | 30.30 | 23.40 | 31.67 |
| **Monthly Avg Price** | | | | | |
| Mean | 19.98 | 20.01 | 22.00 | 22.64 | 21.78 |
| Std Dev | 11.89 | 10.62 | 12.09 | 12.14 | 11.53 |
| 1% | 5.40 | 6.29 | 6.64 | 6.15 | 6.14 |
| 5% | 6.93 | 9.00 | 9.42 | 8.94 | 8.91 |
| 10% | 8.33 | 10.44 | 10.74 | 10.62 | 10.41 |
| 25% | 11.39 | 13.24 | 13.89 | 14.41 | 14.07 |
| 50% | 17.25 | 17.33 | 18.61 | 19.14 | 18.81 |
| 75% | 24.12 | 20.99 | 25.98 | 28.82 | 26.65 |
| 90% | 39.71 | 38.79 | 42.33 | 42.83 | 39.87 |
| 95% | 49.21 | 48.30 | 49.47 | 49.57 | 49.22 |
| 99% | 50.85 | 50.31 | 58.70 | 58.13 | 54.39 |
| Skewness | 1.29 | 1.53 | 1.31 | 1.15 | 1.25 |

Note: This table provides summary statistics of the distribution for the group of video games (73) whose developer is acquired during their lifetime, we call this Target Games. We offer summary stats for four other groups and compare their stats with those of Target Games in columns 6 to 9. Control Group 1 are those games developed by acquired developers before the acquisition takes place. Control Group 2 includes Control Group 1 and those video games developed by the developer after being acquired. Control Group 3 includes control Control Group 2 and all video games that are vertically integrated since inception. Finally, Control Group 4 includes all video games.