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Vertical Integration, Exclusivity and Game Sales Performance in the US Video Game Industry

Ricard Gil and Frederic Warzynski*†

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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 from NPD on video game montly sales from October 2000 to October 2007. We complement these data with handly collected information on video game developers for all games in the sample and the timing of all mergers and acquisitions during that period. By doing this, we are able to separate vertically integrated games from those that are just exclusive to a platform. First, we show that vertically integrated games produce higher revenues and sell more units at higher prices than independent games. Second, we explore the causal effect of vertical integration and find that, for the average integrated game, most of the difference in performance comes from better release and marketing strategies that soften competition and not from ex-ante differences in video game quality. We also find that exclusivity is associated with lower demand. Our estimates suggest that consumers value vertical integration features in their games between 4 and 34 dollars per game.

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1 Introduction

The study of the determinants of the boundaries of the firm is an important area of research in Economics. This started off with Coase (1937) and extended through the works of Transaction Cost Economics theories (e.g. Williamson, 1975,1985 and Klein, Crawford and Alchian, 1978), Property Rights theories (e.g. Grossman and Hart, 1986 and Hart, 1995), and incentive-based theories (Holmstrom and Milgrom, 1991, 1994). These wide variety of theories have left many untested predictions and a scarce empirical literature exploring the prevalence and impact of vertical integration in a determinate set of industries. Recently, Lafontaine and Slade (2009) provide an extensive summary of this literature and strongly emphasize the need for more empirical studies on the causes and consequences of vertical integration. In this paper, we extend the existing literature by studying the impact of vertical integration and exclusivity on game performance in the US video game industry.

Even though this industry has been studied before by others, in the past the analysis has mainly focused on both pricing and marketing strategies (see Nair, 2007 or Chiou, 2009) as well as the role of network effects (see Prieger and Hu, 2006 and Corts and Lederman, 2009). In this paper we focus our analysis on the impact of vertical integration and exclusivity on video game performance. Existing studies have mainly focused on vertical integration between publishers and platforms while proxying vertical integration with software exclusivity (Lee, 2008 and Derdenger, 2008). Due to the existing high correlation between exclusivity and vertical integration, this approximation may not be bad if the goal of the study is to quantify the impact of network effects on hardware demand. Nevertheless, this approximation may 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. In our paper 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 US video game industry.

The data that we use is from NPD on monthly video game sales in the U.S. between October 2000 and October 2007. This data set (widely used by others studying network effects in this industry) contains information on video game sales and revenues, as well as game publisher and platform and video game genre. We obtain average monthly price by dividing revenues by sales in the US. This data set contains information for all video games for all platforms in both 6th and 7th generation. 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 US video game industry between October 2000 and October 2007.

Previous papers on the video games industry (Clements and Ohashi, 2005; Lee, 2008; Derdenger, 2009; Corts and Lederman, 2007) focused on the importance of (direct or indirect) network effects on platform demand and platform competition. We analyze a different issue. We want to estimate differences in video game performance due to vertical integration of platform, publishing and developing companies. One may imagine various reasons why vertical integration should matter for video game performance. Vertically integrated games might be released in "better" periods (Ohashi, 2005); vertical integration may solve contractual frictions in video game development that allow these games to do better; another possible explanation is that publishing companies advertise these games more or market them better. In summary, there are a number of reasons why there could be differences in performance between VI games and non-VI games. Our plan here is to establish stylized facts that confirm these differences in performance and then disentangle the importance of the different explanations behind the existing correlation. In trying to accomplish this goal, we control for as many demand factors as possible that may be unrelated to the channels

through which VI may affect performance. We do this with a reduced form approach while instrumenting for price endogeneity and using a large variety of fixed effects that control for common demand shocks that drive demand at the platform-month-year level. This allows us to establish the channels through which VI affects video game performance at the same time that we account for the importance of network effects and generation effects (Corts and Lederman, 2007).

We separate our 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-integrated games collect higher revenues, and sell more units at higher prices 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 sensitivity and show that demand for integrated video games is higher than independent games. Demand for exclusive games is lower than independent non-exclusive games. Next we explore the source of this difference in demand. Our results indicate that vertically integrated games are not idiosyncratically better or higher quality. Instead, the difference in performance appears to be mainly determined by the release and ex-post-release marketing strategies.

This result is surprising because integrated development of video games is pervasive. According to our data, more than 47% 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 movie industry. As the previous literature has suggested, network effects are important in the video game industry and this would be a justification of why publisher and platforms integrate video game development (even if it is at a cost in video game quality) since platform demand increases. Another 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 outsourced production) in that there are lower transaction costs and adaptation costs of video game development. Publishers then economize on the trade-off between cost and quality. In other words, lower costs of game development compensate for lower quality of these games.

The remainder of the paper is organized as follows. Section 2 describes the vertical chain in the video games industry. We describe our data set and its sources in section 3. Section 4 presents our empirical methodology and preliminary findings. We explore the causal effect of vertical integration in section 5. Section 6 concludes.

2 Institutional Detail: Vertical Chains in Video Games

We focus our analysis on video games for consoles, so we first describe the console market.[1] 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 have recently entered the era of the 7th generation of consoles (XBOX360, PS3, Wii). 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. To simplify the phrasing, we will call the three main actors on the console market the "console companies."

Once the console is acquired by the consumer, games are needed to complement the hardware. The vertical chain of the production of a video game starts with the development of the game. Developers create the content. They can either work for a publisher or be independent (third-party developer). The publisher possesses the rights of the game and is responsible for the marketing and the manufacturing process. An independent developer contracts with a publisher and receives royalties. All developers also pay a licensing fee to the console companies. The console companies all

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

have their own publishing company but there are also many independent publishers, like Electronic Arts (EA). The strategic advantage for console firms to vertically integrate at this stage is that they can preclude the development of the game for other platforms, i.e. creating games unique for one console. This brings additional value for customers. As we will see in the data section, 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 their own video games publishing and developing activities, while they break even or even lose money on the console market.[2]

The video games 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 this, 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 have in mind when analyzing our data below.

[2]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.

3 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 US 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.[3] 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. See that on average a game sold at $23, sold almost 6,000 units a month and collected $220,000 a month. Our data also shows that a game stays on its run an average of 25 months. See as well that 44% of observations are from games developed and published by the same firm (but not platform integrated), almost 5% of observations are from games published by a publisher owned by a platform (but not developed by the platform) and that 3% of the observations are from games developed and published by the same platform.

We can break up these vertical integration (and exclusive of each other) variables and find out that 53% of observations are due to games developed by integrated developer and that 88% of the observations are due to games published by an integrated publisher (and yet not necessarily be an integrated game). Finally, see that when we define integration at the game level non-exclusively, developer-publisher integration increases to 47%, publisher-platform integration raises up to 8% and that, by definition, three-way integration (developer-publisher-platform) remains at 3%.

When breaking our data set by integration status, see in the next three columns that all three types of integration show larger averages of sales, revenues and prices (except publisher-platform integration regarding prices) than the overall sample despite the fact that the games seem all to

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

last the same in the market, around 25 months.

In Table 2A we break up the sample by platform. We show that, within the consoles in the 6th generation, PS2 released over 1,500 games within this period, XBOX 800 and GameCube over 500. For consoles in the 7th generation and up to October 2007, XBOX360 had released almost 200 games for 130 of Wii and 80 of 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, Table 2A 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. This could be explained by the fact that the 7th generation is just starting and consoles rely more on vertical integration at the beginning than at the end of the generation 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.

Finally, Table 2B shows the relation between our non-exclusive vertical integration variables

and our firm level integration variables. Let us use a few examples to illustrate how these variables work. First, imagine the case of a video game developed and published by Nintendo and played in GameCube. In this hypothetical case, we will observe a 1 for all dummy variables,even variables *Integrated Developer*? and *Integrated Publisher*? Imagine now a video game developed by an independent, published by Electronic Arts and played in GameCube. This game will have values such that *Integrated Developer*? = 0 and *Integrated Publisher*? = 1. On the other hand, this game will have value equal to zero for all integrated variables in this table. Lastly, imagine the case of a game developed by an independent, published by Nintendo and played in Wii. This game will have values such that *Integrated Developer*? = 0 and *Integrated Publisher*? = 1. The difference here is that, even though the game developer-publisher integration and the three-way integration variable will take value 0, the game publisher-platform integration variable will take value 1.

Table 2B breaks down statistics both by number of observations and number of games. Let us focus on the bottom part of the table where we compile the number of observations at the game level and therefore each cell contains the corresponding number of games. Out of a total of 3,385 games, 1,855 games are developed by integrated developers. Out of these 1,855 games, 233 are not published by their publishing division. Only 163 are published by a firm owned by a platform and only 117 are developed and published by the same platform owner. On the other hand, 2,996 out of 3,385 games are published by integrated publishers. Of these 2,996 games, 1,474 games are developed by independent developers (independent to the integrated publisher in particular). Similarly, 276 games are published by the owner of their platform and of these 117 (consistently with the other piece of data) are developed and published by the console owner.

4 Empirical Strategy and Results

We divide our empirical exploration in two different groups. The first group estimates cross-sectional differences between integrated and non-integrated games in our three performance measures (revenue, quantity and prices). The second group estimates demand functions where market shares are being estimated as a function of price, number of months since release and the organizational form involved in the game production and distribution.

4.1 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 logarithm of monthly revenues, monthly unit sales and monthly average price. We therefore start our analysis by running separate regressions for each one of the three performance measures such that,

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

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

where $\ln(y_{ipmy})$ represents our three performance measures; $VertIntDP_{ipmy}$ 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} involves information regarding video game genre, platform and month-year fixed effects. We observe clear outliers in our data necessarily due to measurement error and for that reason we limit our empirical exercise to observations with average price ranging between \$5 and \$60 dropping less than 1% of the data. We show results in Tables 3 to 5.

Table 3 offers results of differences in revenues. 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 we observe R-square go from 2% to 60%. Non-surprisingly, the older a game is the lower the revenues it collects. In the following three columns we include genre, month and 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 game vertical integration is positively correlated with higher levels of revenues. Additionally, we also find that video game exclusivity is negatively correlated with weekly revenues.

In Table 4, we undertake the same analysis as in the previous table but this time we use the number of units sold by month and video game as dependent variable. Similarly to Table 3, we find that vertically integrated games sell more units than independently developed and published games, even after controlling for video game age, and video game genre, month and platform fixed effects. We also find that video game exclusivity is negatively correlated with unit sales once we take into account whether a game is developed and published under the same structure.

Finally, Table 5 offers results of pursuing the same type of analysis with average monthly prices (revenues divided by units sold) as dependent variable. Once again we find that vertically integrated games perform better, in this case, sell at higher prices than independently developed and published

games. Contrary to findings above, exclusivity is positively correlated with higher prices.

These results show that there are differences in performance across games developed and published under different organizational forms. In particular, we found that vertically integrated games produce higher revenues, sell more units and sell at higher prices than independently developed and published games. In addition to this, and not central to our paper (but important to other papers in the literature), we found that games independently developed and published games that are exclusive to a platform produce less revenues, sell less units and sell at higher prices than non-exclusive independent games. In the next section, we will uncover how much of these cross-sectional differences are due to differences in pricing and how much due to differences in consumer demand correlated with quality (perceived or real) and organizational form.

4.2 Demand Estimation Methodology and Results

Once established above that vertically integrated games perform better, we now turn to demand estimation to first check that the results above survive the introduction of structure in the estimation. Here we follow the spirit of Lee (2009) in that we minimize the role of substitution across games and focus on substitution across platforms when specifying video game demand. For this reason, we start by modeling video game demand as a binary discrete choice problem, that is, consumer i either buys game j or she does not. This decision is assumed to be separate from buying other games. Let us assume then that the utility that consumer i obtains from buying (and playing) video game j in period t is

$$U_{ijt} = X_j\beta + \alpha p_{jt} + \xi_j + \gamma(t - t_j) + \varphi_t + \epsilon_{ijt}$$

where ϵ_{ijt} is an error term identically and independently distributed distributed across consumers with the extreme value distribution function $exp(-exp(-\epsilon)$. Consider δ_{jt} as the mean utility of video game j in period t such that

$$\delta_{jt} = X_{jt}\beta + \alpha p_{jt} + \xi_j + \gamma(t - t_j) + \varphi_t$$

where X_{jt} are observed game characteristics (that may change across time), p_{jt} is the video game price, ξ_j are unobservable quality characteristics, $\gamma(t - t_j)$ is capturing a trend that makes outside option more attractive as time passes by from the release of video game j t_j, and φ_{0t} is an unobserved time-variant utility component common to all consumer. Given this decomposition of the average utility of a video game per period, we then can rewrite the utility function above as

$$U_{ijt} = \delta_{jt} + \epsilon_{ijt}.$$

On the other hand, the alternative option to buying video game j is not to buy video game j. The utility of this option can be characterized as follows

$$U_{i0t} = \epsilon_{i0t},$$

where ϵ_{i0t} is an error term also distributed with the extreme value distribution. The well-know logit formula provides solution for the market share of game j in period t. In this case, this market share is just the share of the population at risk that buys the video game as opposed to not buying it. The solution specifies that

$$s_{jt} = \frac{\exp(\delta_{jt})}{1 + \exp(\delta_{jt})}$$

and

$$s_{0t} = \frac{1}{1 + \exp(\delta_{jt})}.$$

Then we can apply logs and substract each other to obtain

$$\ln(s_{jt}) = \delta_{jt} = X_{jt}\beta + \alpha p_{jt} + \xi_j + \gamma(t - t_j) + \varphi_t$$

which we can estimate with our data even if we cannot observe a few variables (ξ_j and φ_t), as well as imperfectly measure others (X_{jt} and p_{jt}). At this point, the inclusion of fixed effects will be of great service to control for these unobservables that may influence pricing and therefore create a bias in the estimation of the coefficient α. In this paper, we are not mainly interested in the estimation of α but rather the possible correlation of vertical integration with a few characteristics poorly measured by X_{jt} and ξ_j. This will help us understand the value and source of the impact of vertical integration on video game demand.

For this purpose, we run the following regression equation

$$\ln(s_{ipmy}) = \alpha_0 + \alpha_1 avg\_p_{ipmy} + \gamma_1 X_{ipmy} + \gamma_2 VI(VIDP, VIPP, VIDPP, EXCL) +$$

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

In this specification, the dependent variable follows the analysis in Lee (2009) 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 average price per video game and platform avg_p_{ipmy} per month as our price variable.

Then we add observable game characteristics in X_{ipmy} such as genre fixed effects to control for vertical differences across games and finally we add our main variables of interest: the game-specific vertical relation controls. These supply variables are $DevInt_{ipmy}$, $PubInt_{ipmy}$, $VIDP_{ipmy}$, $VIPP_{ipmy}$, $VIDPP_{ipmy}$ and $EXCL_{ipmy}$. Let us now define each one of these variables: $DevInt_{ipmy}$ takes value 1 if the developer of game i is integrated and 0 otherwise; $PubInt_{ipmy}$ takes value 1 if the publisher of game i is integrated into development and 0 otherwise; $VIDP_{ipmy}$ 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, $VIDPP_{ipmy}$ takes value 1 if game i is distributed by a publisher integrated with its platform and its developer; and finally $EXCL_{ipmy}$ takes value 1 if game i is exclusive to platform p. Since we are after the estimation of γ_2, theoretically we do not care if price is endogenous as long as it does not affect the coefficients on the vertical control variables. We understand that video game pricing is not exogenously determined and will be correlated with a number of dimensions of the unobserved heterogeneity affecting the problem of publishers. For this reason, in our specifications we use as instrument the per genre and platform average number of months that takes the price of a video game go down to 60% of its original highest price at release. This variable is positively correlated with observed average monthly prices and uncorrelated with monthly observed market shares since we are taking averages over all games within a genre and platform.[4] After instrumenting, we start using game and month/year fixed effects and unbundle

[4] We have also used other instruments for avg_p_{ipmy}. The first instrument follows Lee (2009) with lagged prices of

little by little this unobserved heterogeneity allowing us to observe how organizational form may be correlated with vertical differentiation across games that ultimately drives demand up or down.

Aside from this, we control for game age (months since release) using dummy variables α_{2j} and month-year fixed effects α_{3z}. Finally, we introduce month-year-platform fixed effects α_{4jp} to control for platform specific intertemporal substitution. 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 6 to show the results of estimating this demand equation. Similarly to results in Tables 3 to 5, we only use observations with average price ranging between \$5 and \$60.

Table 6 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 -0.0295 and 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.

In column (3) we instrument for price while using separate game and platform fixed effects. The price coefficient increases to -0.0881 and is now significant at 10% level. Our price coefficient has lost statistical significance because our instrument does not have variation across games within genre and platform and we are clustering our standard errors by game-platform dyad. In columns (4) to (6), we add to the specification our set of vertical relation variables (vertical integration and exclusivity) with the same set of fixed effects as in column (3) and others. According to the

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 solve the endogeneity problem and therefore we do not show those results here in this paper.

specification in column (4), holding game and platform constant, it seems that vertical integration is only positively correlated with demand when this takes place between developer and publisher or between publisher and platform. Exclusivity is negatively correlated with demand.

In columns (5) and (6), we introduce integrated developer and publisher dummies to control for firm size and substitute game fixed effects by platform and genre fixed effects and platform/month/year and genre fixed effects respectively. Opening the game fixed effects allows us to know more about how video game organizational form is correlated with the determinants of its demand. These two specifications yield similar results. The price coefficient drops to values around -0.05 and remains statisticaly insignificant mainly due to game level clustering. Other results indicate that games published by integrated publishers do better than independent games regardless of whether their developer and publisher are integrated with each other. In addition to this, if the publisher and developer of the game are integrated with each other, or the publisher is integrated with the game's platform, the game does better than otherwise. Similarly to results in specification (4) we also find that non-exclusive independent games perform better than exclusive independent 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.

5 Exploring the Causal Effect of VI

Once established in the previous section that there is an empirical relation between vertical integration and video game performance and demand, we proceed to consider what are the causes 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. These are the developing stage, the publishing and release stage and finally the post-release stage. This effect could come from the fact that 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) or do a better job at developing games in terms of design and matching with demand trends and platform capabilities. We next explore the role of these three potential explanations by directly investigating the role of the former two and interpreting the residual effect as supporting evidence for the latter.

Table 7 explores the relative importance of these explanations. Column (1) in Table 7 shows the same specification as column (6) in Table 6, while column (2) relaxes platform-month-year joint fixed effects and introduces developer and publisher fixed effects with same qualitative results. Games developed and published by the same company and games published by platform companies have higher demand than independent games. The impact of exclusivity on demand is still negative but not statistically significant. Columns (3) and (4) help us disentangle the importance of the three explanations briefly outlined above.

As mentioned above, one possible way in which publishers may affect performance of their internally developed games relative to the games that they distribute but developed by others is by providing more effective marketing strategies and promotional activities after the game is released

(better targeted marketing campaigns or more advertising).

To explore the relevance of this potential explanation, we introduce game-platform fixed effects. By doing this, we are able to identify changes in demand due to changes in the game's organizational form during its run 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 level, we run OLS regression in this specification confident that the game-platform fixed effect captures all unobservable characteristics idiosyncratic to the game-platform level and that may affect pricing.

We show the results of exploring this explanation in column (3) of Table 7. According to our results, changes in developer or publisher integration status without a change in game integration status are associated with a negative and positive change in demand respectively. This is consistent (although not a direct test) with implications from Grossman and Hart (1986) in that, immediately after integration, the acquired firm will experience a decline in performance while the acquiring firm will increase its performance.

Additionally, we now observe that a game's demand increases by 16 percentage points once the game becomes developer-publisher integrated. This is evidence that one of the integration benefits in this industry comes from better marketing strategies even after the release period. On the other hand, we do not observe any difference in demand due to three-way integration and no game experienced a change in publisher-platform integration status since no publisher belonging to a platform merged or acquired other publishers during the period of study. Exclusivity again shifts demand down during the run of a video game.

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 release strategies differ for games distributed by publishers whether these own their developers. He finds that integrated games are released further apart in time than non-integrated games. In other words, publishers soften competition for their internally developed games more than they do for their independently developed games and therefore increase sales for vertically integrated games.

We explore this possibility by adapting our demand estimation methodology. Note that our initial empirical strategy implicitly follows Lee (2009) and assumes that there is no substitution across games while focusing on the intertemporal substitution across platforms as the main deterrent of current game purchases. Evidence in Ohashi (2005) and Derdenger (2008) suggests otherwise and 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 importance of this potential explanation, we follow in spirit the empirical methodology of Ohashi (2005). In his paper, he 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 do the same function with the advantage that using fixed effects allows us to add nonlinearities that otherwise would be ignored if we just included a linear regressor. In particular, in column (4) of Table 7, we introduce platform-month-year-genre-age fixed effects. We can use this vast number of fixed effects because of the richness of our dataset. Importantly this allows us to control for differences in game competition within genre released in any given month. Any effect of vertical integration found in these specifications may be due to correlations of vertical differences

between games and differences in organizational form across games. Similarly to the specification in column (3), our multidimensional fixed effect eats up the limited variation in our instrument and therefore we run a simple OLS regression.

The results in this last column of Table 7 shows the effect of vertical integration after controlling for changes in competition. To make sense of these results we need to compare these results to those in columns (1) and (3) of Table 7. In column (1) of Table 7 the coefficient on $GameIntDev - Pub$ is +0.25. This same coefficient in column (3) is +0.16. This means that there are 9 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 7 yields a coefficient of +0.16 that lacks statistical significance. The combination of the results in these two columns basically imply that better release strategies explain 16 extra percentage points in performance, that the quality of integrated games is the same as that of independently developed and published games and that softening competition through coordinated release explains the remaining 8 percentage points in extra demand.

The effect of publisher and platform integration is difficult to disentangle with our empirical methodology. The results in column (1) of Table 7 indicate that this type of integration is associated with an increase of +1.42 percentage points extra in demand. We cannot determine what percentage of this correlation is due to better marketing strategies since there is no variation in our data at the game level. Instead, we do observe that in column (4) of Table 7 the coefficient jumps up to +1.74 percentage points. This implies that accounting for softer competition at release does not diminish the effect. If anything, it diminishes demand by 22 percentage points indicating that this effect is not important for release of games published by the platform themselves. This leaves the joint effect of higher quality and better marketing strategies (post-release) at a positive +1.74. Since this type of integration does not include the developing stage, it may be safe to attribute the entire

magnitude of this coefficient to better marketing strategies.

When it comes to exploring the effect of three-way integration with a platform, we observe that the results go from a non-statistically significant -0.24 coefficient on the three-way interaction in column (3) to a statistically significant -0.82 in column (4). In column (1) this coefficient takes value -0.26 and not statistically significant. This would mean that games that are three-way integrated have on average 82 percentage points less of demand and that the ability of coordinating better their release and softening initial competition boosts up their demand by nearly 56 percentage points.

The evidence from Table 7 shows that both ex-post promotional activities and release month decisions are plausible explanations for the total impact of vertical integration on video game performance. The question now is whether vertical integration has any effect in the developing stage and 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 8 provides a summary of the impact of all three causal explanations of vertical integration on video game demand. In this table, we also use the coefficient on average price to make "back of the envelope" calculations of how much consumers value game characteristics correlated with vertical integration. If anything, we find that on average games internally produced are of lower quality than those produced by independent developers. On average, consumers value vertical integrated games between \$4 and \$34 dollars more than independent games. Post-release marketing strategies increase willingness to pay by \$5.5 in developer-publisher integrated games and release strategies increase willingness to pay by \$66 in developer-publisher-platform integrated games. There does not seem to be a relation between vertical integration and video game quality that translates into higher willingness to pay for a game.

These results are, at least to us, surprising and open the question of why publishers and platforms integrate at all into development, and more so, why these acquire developers that otherwise they could be producing "better games" at arm length's transactions. A possible reason why we observe this effect at the development and prior to release 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 publisher represent the result of a better (endogenous) match between publishers and developers within the same company than the match of independent firms working together. Finally, another potential explanation is that network effects matter 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 will determine the platform demand itself.

6 Conclusion

In this paper, we empirically examine the relation between vertical integration and video game performance in the US. 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 we do this, we attempt to evaluate the causes of the impact of vertical integration on video game demand by differentiating three possible sources: better marketing strategies ex-post video game release, better timing of video game release strategies and/or inherently higher quality of video games.

Our results indicate that the superior performance of integrated games is mainly due to softer competition at release and better post-release marketing strategies. In particular, we find post-release marketing strategies to boost video game demand by a maximum of 16 percentage points

and softer competition at release to increase demand between 8 and 108 percentage points. Surprisingly, our results suggest that video games developed and published by the same firm are not better than those independently developed and published. If anything, these integrated video games are inherently worse than independent games, ceteris paribus. Related 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 surprising 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 its currently status. 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 too high.

Despite the efforts in the current article, we left many windows open to stir discussion and for future research. For instance, we did not address the endogeneity of the vertical integration variable nor why we observe mergers, acquisitions and takeovers in this industry during the 7 years that our data spans. In the future, we will examine this research question while relying in results in the current research to shed light more generally on what drives organizational form in innovative industries. The object 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.

7 References

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

	All obs.	If VertInt Dev-Pub	If VertInt Pub-Platf	If VertInt Dev-Pub-Platf
Monthly Revenues	220172.3	274473.4	350968.8	609629.9
	(1449824)	(1651469)	(1597786)	(3604588)
Average Monthly Price	22.9	25.6	22.9	24.3
	(12.0)	(12.6)	(14.1)	(13.6)
Monthly Units Sold	5946.3	7217.0	9071.9	14926.1
	(29587.0)	(34419.9)	(31843.6)	(67409.6)
Age	25.0	25.0	26.5	26.0
	(18.1)	(18.3)	(18.6)	(18.8)
Vertical Integration Variables				
VertInt Dev-Pub?	44.03%	100%	-	-
VertInt Pub-Platf?	4.67%	-	100%	-
VertInt Dev-Pub-Platf?	3.41%	-	-	100%
Integrated Developer?	53.31%	100%	17.13%	100%
Integrated Publisher?	88.43%	92.40%	100%	100%
Game Int Dev-Pub?	47.40%	100%	0%	100%
Game Int Pub-Platf?	8.30%	0%	100%	100%
Game Int Dev-Pub-Platf?	3.41%	0%	0%	100%

Note: This table provides summary statistics for three performance outcome variables, revenues, price and units sold. It also provides statistics for vertical integration variables used in our empirical methodology. Note that the first three variables are exclusive of each other whereas the last three are inclusive. We use the former three to establish cross-sectional differences among games and the latter three for our more detailed analysis that will shed light on how vertical integration impacts game performance.

Table 2A. 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 2B. More Descriptive Statistics for Vertical Integration Variables

By Observation

		Game Int Dev-Pub?		Game Int Pub-Platf?		Game Int Dev-Pub-Platf?	
		No	**Yes**	**No**	**Yes**	**No**	**Yes**
Integrated Developer?	**No**	60,428	0	55,421	5,007	60,428	0
	Yes	7,600	61,388	63,233	5,755	64,579	4,409
Integrated Publisher?	**No**	10,624	4,342	14,966	0	14,966	0
	Yes	57,404	57,046	103,688	10,762	110,041	4,409

By Game

		Game Int Dev-Pub?		Game Int Pub-Platf?		Game Int Dev-Pub-Platf?	
		No	**Yes**	**No**	**Yes**	**No**	**Yes**
Integrated Developer?	**No**	1,530	0	1,417	113	1,530	0
	Yes	233	1,622	1,692	103	1,738	117
Integrated Publisher?	**No**	289	100	389	0	389	0
	Yes	1474	1,522	2,720	276	2,879	117

Note: This table offers cross-tabulations of vertical integration variables by weekly observation (top of the table) and by video game (bottom of the table). From these, one may be able to construct VertInt Dev-Pub, Pub-Platf and Dev-Pub-Platf.

Table 3. Empirical Relation Between Vertical Integration and Monthly Video Game Revenues

Dep Var: log(revenue)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
VertInt Dev-Pub	0.4721	0.4745	0.5625	0.5345	0.5196
	(0.0586)***	(0.0574)***	(0.0588)***	(0.0574)***	(0.0564)***
VertInt Pub-Platform	1.2459	1.4287	1.5106	1.5399	1.5933
	(0.1476)***	(0.1400)***	(0.1329)***	(0.1322)***	(0.1303)***
VertInt Dev-Pub-Platform	1.5317	1.6297	1.7846	1.8069	1.8459
	(0.2051)***	(0.2049)***	(0.1896)***	(0.1805)***	(0.1919)***
Exclusivity	-0.1629	-0.0209	-0.0640	-0.2308	-0.3591
	(0.0598)***	(0.0504)	(0.0489)	(0.0547)***	(0.0558)***
Age		-0.1182	-0.1183	-0.1106	-0.1087
		(0.0012)***	(0.0012)***	(0.0017)***	(0.0017)***
Constant	9.1073	11.8195	11.7972	12.2475	11.9890
	(0.0503)***	(0.0501)***	(0.0486)***	(0.1322)***	(0.1404)***
Genre FE	No	No	Yes	Yes	Yes
Month FE	No	No	No	Yes	Yes
Platform FE	No	No	No	No	Yes
Observations	122069	122069	122069	122069	122069
R-squared	0.02	0.6	0.63	0.65	0.66

Robust standard errors in parentheses and clustered by game-platform dyad.
* significant at 10%; ** significant at 5%; *** significant at 1%

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

Dep Var: log(quantity)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
VertInt Dev-Pub	0.3813	0.3834	0.4616	0.4459	0.4351
	(0.0559)***	(0.0552)***	(0.0563)***	(0.0556)***	(0.0549)***
VertInt Pub-Platform	1.2009	1.3574	1.4403	1.4712	1.5178
	(0.1367)***	(0.1321)***	(0.1264)***	(0.1261)***	(0.1257)***
VertInt Dev-Pub-Platform	1.4364	1.5203	1.6474	1.6765	1.7193
	(0.1809)***	(0.1843)***	(0.1719)***	(0.1665)***	(0.1771)***
Exclusivity	-0.2764	-0.1548	-0.1692	-0.2970	-0.4128
	(0.0557)***	(0.0483)***	(0.0467)***	(0.0529)***	(0.0542)***
Age		-0.1012	-0.1012	-0.0963	-0.0946
		(0.0011)***	(0.0011)***	(0.0017)***	(0.0017)***
Constant	6.2613	8.5831	8.5489	9.0342	8.7639
	(0.0478)***	(0.0471)***	(0.0458)***	(0.1274)***	(0.1359)***
Genre FE	No	No	Yes	Yes	Yes
Month FE	No	No	No	Yes	Yes
Platform FE	No	No	No	No	Yes
Observations	122069	122069	122069	122069	122069
R-squared	0.02	0.55	0.58	0.6	0.61

Robust standard errors in parentheses and clustered by game-platform dyad.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Empirical Relation Between Vertical Integration and Average Monthly Video Game Price

Dep Var: log(average price)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
VertInt Dev-Pub	0.0907	0.0911	0.1008	0.0886	0.0845
	(0.0105)***	(0.0102)***	(0.0105)***	(0.0098)***	(0.0097)***
VertInt Pub-Platform	0.0450	0.0713	0.0703	0.0687	0.0756
	(0.0250)*	(0.0227)***	(0.0217)***	(0.0220)***	(0.0201)***
VertInt Dev-Pub-Platform	0.0953	0.1094	0.1373	0.1304	0.1266
	(0.0344)***	(0.0311)***	(0.0269)***	(0.0248)***	(0.0250)***
Exclusivity	0.1135	0.1339	0.1052	0.0661	0.0537
	(0.0106)***	(0.0095)***	(0.0093)***	(0.0100)***	(0.0098)***
Age		-0.0170	-0.0171	-0.0143	-0.0142
		(0.0002)***	(0.0002)***	(0.0003)***	(0.0003)***
Constant	2.8460	3.2364	3.2483	3.2134	3.2251
	(0.0088)***	(0.0097)***	(0.0096)***	(0.0229)***	(0.0248)***
Genre FE	No	No	Yes	Yes	Yes
Month FE	No	No	No	Yes	Yes
Platform FE	No	No	No	No	Yes
Observations	122069	122069	122069	122069	122069
R-squared	0.02	0.37	0.4	0.46	0.46

Robust standard errors in parentheses and clustered by game-platform dyad.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Video Game Demand Estimation Accounting for Vertical Integration Characteristics

Dep Var: log(Share)

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	**OLS**	**2SLS**	**2SLS**	**2SLS**	**2SLS**
Average Price	-0.0015	-0.0295	-0.0881	-0.0637	-0.0484	-0.0577
	(0.0027)	(0.0016)***	(0.0544)*	(0.0523)	(0.0528)	(0.0532)
Integrated Developer					0.1029	0.0950
					(0.0876)	(0.0869)
Integrated Publisher					0.3847	0.3811
					(0.0898)***	(0.0907)***
Game Int Dev-Pub				0.3840	0.2607	0.2547
				(0.0555)***	(0.0912)***	(0.0908)***
Game Int Pub-Platform				1.5075	1.4108	1.4267
				(0.1411)***	(0.1424)***	(0.1420)***
Game Int Dev-Pub-Platform				-0.2674	-0.2324	-0.2604
				(0.2460)	(0.2460)	(0.2416)
Exclusivity				-0.4370	-0.3795	-0.3837
				(0.0555)***	(0.0572)***	(0.0599)***
Constant	-7.3932	-10.1737	-5.5180	-6.0403	-6.7698	-10.2551
	(0.2328)***	(0.2048)***	(1.1932)***	(1.1476)***	(1.1593)***	(1.1706)***
Age FE	Yes	Yes	Yes	Yes	Yes	Yes
Month-Year FE	Yes	Yes	Yes	Yes	Yes	No
Game-Platform FE	No	Yes	No	No	No	No
Game FE	No	No	Yes	Yes	No	No
Platform FE	No	No	Yes	Yes	Yes	No
Genre FE	No	No	No	No	Yes	Yes
Platform-Month FE	No	No	No	No	No	Yes
Observations	121791	121791	121482	121482	121482	121482
R-squared	0.61	0.9	0.6	0.63	0.63	0.64

Robust standard errors in parentheses and clustered by game-platform dyad.
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 7. The Impact of Vertical Integration on Video Game Demand: Development versus Marketing

Dep Var: log(Share)	**(1)**	**(2)**	**(3)**	**(4)**
	2SLS	**2SLS**	**OLS**	**OLS**
Average Price	-0.0577	-0.0333	-0.0298	-0.0134
	(0.0532)	(0.0592)	(0.0016)***	(0.0055)**
Integrated Developer	0.0950	-0.4655	-0.1706	0.3836
	(0.0869)	(0.1058)***	(0.0999)*	(0.2025)*
Integrated Publisher	0.3811	-0.3626	0.2550	0.3787
	(0.0907)***	(0.1578)**	(0.1512)*	(0.1947)*
Game Int Dev-Pub	0.2547	0.7515	0.1635	0.1672
	(0.0907)***	(0.1245)***	(0.1044)*	(0.1986)
Game Int Pub-Platform	1.4267	2.0648	-	1.7434
	(0.1420)***	(0.4818)***	-	(0.3421)***
Game Int Dev-Pub-Platform	-0.2604	-0.3120	-0.2450	-0.8259
	(0.2416)	(0.3243)	(0.4588)	(0.4807)*
Exclusivity	-0.3837	-0.0909	-0.1643	-0.5384
	(0.0599)***	(0.0557)	(0.0385)***	(0.1371)***
Constant	-10.2551	-7.5844	-10.2812	-9.0032
	(1.1706)***	(1.4595)***	(0.2515)***	(0.2378)***
Age FE	Yes	Yes	Yes	No
Platform-Month FE	Yes	No	No	No
Month-Year FE	No	Yes	Yes	No
Developer FE	No	Yes	No	No
Publisher FE	No	Yes	No	No
Game-Platform FE	No	No	Yes	No
Platform-Month-Genre-Age FE	No	No	No	Yes
Observations	121482	120955	121791	121791
R-squared	0.64	0.75	0.9	0.9

Robust standard errors in parentheses and clustered by game-platform dyad.
The instrument used for average price in 2SLS regressions is the average time in months to decrease to 60% of

Table 8. 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 (3) Table 7	(3) Mktg Strategies + Quality Effect Column (4) Table 7	(4) Net Quality Effect (3)-(2)	(5) Net Release Period Effect (1)-(3)
Game Int Dev-Pub	β	**0.2547**	**0.1635**	0.1672	0.0037	0.0874
		0.0907	**0.1045**	0.1986	0.2244	0.2182
	USD	4.4146	**5.4923**	12.5257	7.0334	-8.1111
		4.3670	**3.5212**	15.7416	16.1306	16.3361
Game Int Pub-Platform	β	1.4267	0†	**1.7434**	0†	-0.3168
		0.1420	-	**0.3421**	-	0.3703
	USD	24.7322	0†	**130.5806**	0†	**-105.8484**
		22.9572	-	**22.9572**	-	**32.4664**
Game Int Dev-Pub-Platform	β	0.2604	-0.2450	**-0.8259**	-0.5809	**1.0862**
		0.2416	0.4588	**0.4807**	0.6645	**0.5379**
	USD	4.5136	-8.2293	**-61.8556**	-53.6263	**66.3693**
		5.9073	15.4201	**44.1084**	46.7261	**44.5022**
Exclusivity	β	**-0.3837**	**-0.1643**	**-0.5384**	**-0.3741**	0.1548
		0.0599	**0.0385**	**0.1371**	**0.1424**	0.1496
	USD	-6.6512	**-5.5201**	**-40.3272**	**-34.8071**	**33.6760**
		6.2255	**1.3269**	**19.5299**	**19.5750**	**20.4982**

Note: Numbers in columns of 4: top number is coefficient and % impact on market share. Third number is back of the envelope calculation result of dividing coefficient by corresponding price coefficient. Standard errors appear in small font size. 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).