KIND Knowledge Innovation Network
Dynamics Research Group
Institut Mines-Télécom, Télécom Ecole de Management

TELECOM Ecole de Management
Managing through Technology

Paper to be presented at the International Conference on

Organizations, institutions and innovation in the ICT sector: Where do we stand?

Conference organized by Institut-Mines Télécom,
Télécom École de Management
in Paris, 25-26 June 2012

Video Game Niches: Specialization, Substitutability and Strategy

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June, 2012

ABSTRACT

This paper shows how video game publishers' choice of game release date is affected by the expected level of competition within the game's product niche. We identify niches by genre, age-appropriateness, intended console system, and game quality. First, we document that video game publishers are highly specialized in each of these dimensions of product differentiation. Thus, one of the few post-production strategic variables available to publishers is the date on which to release the title. Second, we show that consumer substitution across games is strongest within each of these dimensions describing niches. Because sales volumes decay quickly after opening weekend, at any point in time, a niche will typically be served by few current titles. Thus, publishers have incentives to avoid releasing during periods of fierce intra-niche competition. Third, we show that release date appears to be adjusted so that games are released so as to avoid weeks when its niche is relatively well served.

Keywords: Video Games, Strategy, Niche

JEL Code: D43, L13, L96

I. Introduction

We examine video game publishers' strategic use of game release dates so as to maximize game sales and profits. First, we show that there is supply-side specialization into niches defined by gaming consoles, game genre and age-appropriateness, i.e., rating of the Entertainment Software Board (ESRB). Second, we show that most of the demand-side substitution is within these niches. Much like box offices receipts for movies, game sales decline quickly after their week of release and are considerably higher when they are more highly rated by consumers and reviewers. In addition, we show that game sales fall when the other currently popular games are rated highly or are newer and that these rating and age effects are stronger for competing games within the same console, genre, or ESRB niche. These market characteristics suggest that publishers have incentives to strategically avoid release weeks in which there are many high quality and newer games available within their niche. Finally, we test this strategic release date hypothesis by estimating a hazard function of the time to a publisher's next release. We find that game release is delayed when the released game's niche is 'saturated' with more highly rated and newer games.

Sales of video games have doubled in the past decade in the US to over $10 billion annually, comparable to first-run movie ticket sales. Overall, video games feature many characteristics in common with other forms of entertainment such as movies and music. Games are characterized by a large degree of product variety in game content along multiple dimensions. For example, horizontal differentiation occurs across game genre, gaming platform, and age appropriateness of content. Vertical differentiation occurs as some games are generally perceived to be better than others in terms of quality of game play, realism of graphics and the appeal of the story narrative. Games depreciate quickly as a gamer will often complete a game within a few

weeks. Demand for game play drops off considerably after completing a game. Gaming often entails a degree of a social bandwagon effect in which peers prefer to play and discuss the same games simultaneously. This can result in some games becoming "blockbusters" seemingly out of proportion to the reported measures of game quality.

The production of video games similarly shares other features with other entertainment goods. As with other information goods, they generally exhibit large fixed cost of production and small marginal cost of duplication. Publishers can invest more in game production so as to develop a game of higher quality in order to increase game demand, however some of the perceived quality cannot be anticipated during the game development stage. This makes a portion of the demand for a game stochastic from the developer's point of view. In addition, because many games place different storylines and action points on top of common computer code shared by multiple games, game production can exhibit substantial economies of scope. However, developers may also have core competencies (e.g., computer code, graphic images, and story editors) that are relevant to narrow niches of games (e.g., console operating system, age group of audience, and style of play). Finally, advances in the underlying computer technology imply that developers must redesign even core game components from time to time.

Game publishers face a series of strategic decisions at certain junctures. A publisher must decide what intellectual property and core competencies to develop. This could entail, for example, developing or outsourcing a physics engine that governs the movement of virtual objects within the games. The publisher then must decide how to exploit these core competencies by choosing which specific product attributes to incorporate into a game. This decision usually is associated with choosing a specific horizontal niche. Similarly, the publisher must decide where in the quality dimension it wishes to place its game. While there is some uncertainty about how a

game will ultimately be received, market participants know that gamers value higher quality content along a number of related dimensions (e.g., graphics, story line, response time, degree of difficulty, game "balance", etc.) that require greater *ex ante* investment. For each game, publishers must decide to what extent they will vertically integrate into game development versus outsourcing to third-party developers (Gil and Warzynski, 2010). Most games are developed by the firm that will eventually publish it. However, the industry has seen some degree of vertical disintegration as developers have specialized in specific competencies. Once game development is nearer to completion, publishers decide on the extent of the marketing campaign to support the game. Up until now, publishers have had some degree of flexibility to alter over the release date but now must lock in a release date to correspond with the marketing campaign. A publisher may use current and expected market conditions to choose to delay the release of a game so as to avoid release dates when the competition within the game's niche is particularly fierce. Finally, publishers choose the price for the game. Much like movies and music, there is much less variation in new game prices than in new game unit sales.

We focus on the game release date decision and how it is affected by expected competition. Since this decision crucially depends on the importance of specific niches in the video game market, we first demonstrate the degree to which firms specialize by niche and the degree to which consumers substitute across and within niches. These analyses imply that releasing a game in a week when other within-niche games are particularly popular can greatly reduce the game's overall sales. Since game sales decline quickly with time on the market, delaying the game release date by just one or two weeks could greatly increase sales and profits. We find evidence consistent with strategic publisher behavior so as to avoid the fiercest competition.

This paper adds to the existing literature in various ways. First, as Williams (2002) suggests, we document the importance of niches with the incorporation of more product characteristics, such as age appropriateness, genre, console and quality into our model. Second, our use of weekly, rather than monthly, sales data better matches the release date strategic decision as games are usually released for the peak weekend demand. Third, by incorporating both supply and demand features, we can offer a fuller explanation of various aspects of strategic behavior.

II. Previous Literature

Economic analyses of the video game market have only begun to appear in the last decade. Clemens and Ohashi (2005) show the importance of indirect network effects between console adoption and software supply decisions for pricing with their results suggesting that introductory pricing is an effective practice at the beginning of the product cycle. Expanding software variety, however, becomes more effective later. In line with that Prieger and Hu (2006) find significant effects of both price and software variety on video game console demand, suggesting substitutive effects between price and variety. Liu (2010) proposes a structural model for pricing strategies in the video game console market and shows that consumer heterogeneity provides incentives to price skim while network effects lead to penetration pricing. Chao and Derdenger (2011) show how mixed bundling can help overcome problems associated with new product introductions in two-sided markets in their application to the portable game console market.

However, besides game and console pricing, game quality is also impacting players' decisions to buy particular games. Video games tend to be experience goods for which gamers cannot know their preferences without playing. Zhu and Zhang (2010) use this notion to show that

consumer reviews of video games are positively related to game sales. In addition, Bounie et al. (2005) confirm that online customer reviews positively influence purchasing decisions in the video game industry. Chevalier and Mayzlin (2006) provide supplemental evidence from a different industry as they show the positive impact of online book reviews on book sales.

Nevertheless, perceived quality and pricing might not be the only driving forces for video game demand and supply. Thus, Claussen et al. (2010) show that, for the US handheld video game industry, backward compatibility influences both demand and supply and could be used to sustain market dominance. Also, video game demand and supply might depend on the release timing of games as publishers might cannibalize own and competitors' sales if they launch a specific game in a time period where it competes for sales with a similar game already released. Grohsjean and Kretschmar (2008) tackle the behavior of firms in the US gaming industry towards potential cannibalization and provide evidence that publishers are generally reluctant to cannibalize their existing success. Gil and Warzynski (2010) show how publisher-developer vertical integration can affect the quality, and thus sales, of video games. Ohashi (2005) indicates that the ownership structure of a launched game also matters for cannibalization. His evidence for the US video game industry suggests that games under joint ownership are released in larger time intervals than those owned by different publishers.

The academic literature pertaining to video games that is probably the largest investigates whether video game violence leads gamers to become violent in real life. Meta-analyses by Anderson and Bushman (2001) and Sherry (2001) analyzed 35 and 30 articles respectively. Later, Anderson (2004) identified 44 published studies. These laboratory experiments and correlational studies predominately support increased aggression as suggested by the theory of desensitization. More recently, Ward (2010) criticized the correlational studies for not incorporating other

covariates into their analyses that might offer alternative explanations. Also, Ward (2011) and Cunningham, et al. (2011) examine the issue by linking video game sales to actual violent criminal behaviors to suggest that laboratory experiments may lack external validity.

III. Data

We have constructed a sample of about one thousand popular console-based video games released over a four year period from 2005 to 2008. From VGChartz[1], we observe the publisher, the release date, the console it was developed for and its weekly unit sales while it was in the top 50 US sellers. The VGChartz website reports detailed video console game unit sales consistently from 2005 onwards for several geographic regions including the US. For each game, we append its rating from the Entertainment Software Rating Board (ESRB).[2] The ESRB is a non-profit body independently assigning technical ratings to each new game which defines the age of the audience for which the game is appropriate. No other study we are aware of has matched ESRB rating information to games. Finally, we obtain a measure of game quality from Gamespot,[3] a professional video game rating firm whose staff reviews almost every game launched by rating the quality of the titles on a scale from 1 to 10 with 10 being the best possible rank. We describe all databases in more detail in the following.

A. VGChartz

Our primary data source is VGChartz. They report weekly unit sales for each of the top 50 selling video console games in the US on their website that provides a dataset consisting of 1,192

[1] See http://www.vgchartz.com
[2] See http://www.esrb.com
[3] See http://www.gamespot.com

different titles from 2005 to 2009. The data that were obtained are for games designed for nine different gaming consoles. However, the sample contains few games for the consoles Game Boy Advanced, GameCube and Xbox. In order to generate meaningful results, we drop these observations for our analysis leaving 1,150 games in our sample. The remaining six consoles in our analysis are Nintendo DS, PlayStation 2 and 3, PlayStation Portable, Wii and Xbox 360. Overall, the Xbox 360 and Playstation 2 are the most common consoles in our sample featuring about 24 respectively 20 percent of the games surveyed.

VGChartz also provides the publisher for each game listed. However, a single firm may have entries that specify a subsidiaries or in-house development groups and teams. To study the degree of firm specialization, we count games from subsidiaries of publishers as being published by their parent company resulting in 42 different publishers. The sample includes some large publishers like, e. g., EA being responsible for publishing more than 200 games and smaller publishers like, e. g., Valcon or Zoo Games which each have one game in the sample. We also added information about developers to our sample to identify 208 different developers. As with publishers, we grouped subsidiaries and in-house teams to their parent developer companies.

Game genres classifications that were obtained from VGChartz were too narrow for the type of analysis we intend. Instead, we group the genre information into braoder categories based on the genre definitions from Gamespot[4] as described in Egenfeldt-Nielsen et al. (2008). For example, since the sample contains few racing and adventure games, we grouped racing games in the sport and action category and group adventure games together with role playing games as they share similar content. In addition, we include a genre category for music and party games which

[4] Overall, there is no standardized principle for defining video game genres making the selection somewhat arbitrary. However, Gamespot has developed a broad competence in assessing and valuing video games making its genre definition a suitable choice for our data.

comprise about one tenth of all games. We group shooter and platform games together as they feature a distinct gameplay experience compared to other action games. Nevertheless, classifying games in one specific genre is problematic as some games could easily be categorized in two different genres, e. g. Mass Effect features action parts as well as role playing aspects. Overall, about 52 percent of the games of our sample include some sort of action, followed by sports (28 percent) and role playing games (26 percent).

For each game title, we observe weekly unit sales information so long as the game remains in the top 50 sellers. The week is a natural unit of aggregation as games are typically released for weekend play. We observe more weeks of data for more popular games that remain among the top 50 sellers for longer. On average, we observe 10 weeks of sales data per game but there is considerable variation. Figure 1 depicts the distribution of weeks in the top 50 for our data. Almost all video games in our sample exhibit a strong decline in sales after its release date. Figure 2 depicts this decline for the average game. Finally, there is great variation in the popularity of different game titles. Figure 3 depicts the distribution of the natural logarithm of unit sales for initial week after the game's release.

B. ESRB Rating

The age appropriateness ratings for each game assigned by the ESRB board are E, E10, T, M[5] where E classifies games for everybody, E10 for everyone aged 10 and up, T for teens, M

[5] Technically there is also a rating of A for adult content only. However, this rating is rarely applied and covers mostly games with pornographic content. Our sample does not contain games with this rating.

games for a mature audience.[6] The ESRB is an industry-supported, non-governmental body with the goal of providing a simple system to inform parents about the content of games their children may want to play. In this sense, it plays a similar role to Motion Picture Association of America (MPAA) ratings for movies. We looked up the ESRB ratings and content descriptors for each game in the sample. Overall, categories with the most games are those suitable for everybody (33 percent) or for teen audiences (34 percent).

C. GameSpot Score

Our measure of game quality derives from the expert review data from the GameSpot website. Launched in May 1996, GameSpot provides the latest news, reviews, previews and links to portals for all current platforms. It also includes a list of the most popular games and features a search engine for users to track down games of interest. Almost every game in our sample was reviewed by the GameSpot staff which assigned ratings on a scale from 1 to 10. These so called GameSpot-Scores are intended to provide an at-a-glance sense of the overall quality of the game. The overall rating we collected is based on evaluations of graphics, sound, gameplay, replay value and reviewer's tilt.[7] The quality rating of the games can be expected to be positively correlated with their sales as better-rated games usually are more highly demanded (Zhu and Zhang, 2010). However, it is possible that some games feature the opposite relationship if they are based on a popular tie-in from a movie, e. g. the Harry Potter franchise or the Final Fantasy series. Both

[6] A detailed description of the mechanism determining the assigning of the ratings can be found in Federal Trade Commission (2007) or at the ESRB website.

[7] Mid 2007 there was a change in the review system of gamespot. Games reviewed based on the new system only get an overall rating and no detailed rating in each category. However, as each category is still reviewed in detail we do not consider this change to noticeably affect the overall GameSpot-score.

publishers and developers know that these games will sell well due to their popular tie-in which may lower the returns to investment in game quality.

IV. Empirical Analysis and Results

Our data allow us to generate measures of horizontal differentiation (console, genre, ESRB rating) and vertical differentiation (Gamespot score). These allow us to define niches and measure within and across niche substitutability. Since we observe many game titles for each publisher, we can test for scope economies along these multiple dimensions of differentiation. Furthermore, during any week, we can use sales data to measure how well the industry and each publisher are serving each niche. We link this niche level sales information to a multi-dimensional state variable and conjecture that publishers respond to the current values of this state variable.

We first examine the importance of niches in the video game market and then use this information to investigate strategic use of game release timing to exploit temporal opportunities within niches. First, we provide evidence of supplier side specialization by: gaming console, game genre, game age appropriateness, and game quality. Second, we estimate a video game demand function that provides evidence of greater substitution across games within similar product attributes defined along these dimensions. Finally, having established that video game niches are important, we estimate a hazard function for time between a publisher's game releases to show that publishers tend to alter the release date of games to avoid periods when the game's niche is already saturated with popular games.

A. Do Game Developers and Publishers Specialize?

As described above, game developers have a number of decisions to make when they undertake to create a new game. We concentrate on those decisions that represent game product attributes that are revealed in general measures of product differentiation. The horizontal product differentiation attributes we consider are: game age appropriateness as measured by ESRB rating, the gaming console on which the game operates, and the genre of the game. For each developer with more than 10 games in our sample, table 1 lists the number of games for each possible value of ESRB, console, and genre measures. For each of these measures, we report χ^2 test statistics for the null hypothesis that developers choose attributes independently across games. In all cases, we strongly reject the null. This provides our first piece of evidence that developers specialize along these dimensions.

It is possible that game developers specialize because of the technical nature of their stage in the supply chain. Game publishers' role does not include these technical tasks, though many publishers are also vertically integrated into game developing. Table 2 repeats the analysis of Table 1 for publishers rather than developers. Once again, we strongly reject the null hypothesis that publishers choose game attributes independently across games.

Game developers and publishers also must decide how much to invest in the overall "quality" of a game. Quality may be relatively more expensive for some firms than others. A firm's typical game specialty might be in producing an expensive to produce, high-quality, best-seller, or in producing an inexpensive, low-quality, modest-seller, or in anything in between. If so, the typical quality for a firm could be different from the typical quality for the industry. We test this by regressing game's Gamespot Scores on a set of firm dummy variables. Table 3 reports

these regressions for both developers and publishers. Dummy variables are included for all firms with more than 10 games in our sample. The left out group then represents the firms with fewer games. Note that quite a few developers and publishers have average Gamespot Scores that are significantly different from the left out group. An F-test for the constraint that all dummy variable coefficients are zero is rejected with a great degree of certainty. In fact, almost all of the significant coefficients are positive. Since these tend to be the firms that are producing more games, this suggests that higher quality is learned through experience or that there is increasing returns to producing quality.

We investigate possible returns to specialization by comparing the effect of the attributes of the most recent games released by a publisher on the attributes of new games. The first three columns of table 4 analyze the three measures of horizontal differentiation. For example, column 1 reports the results of a Logit regression where the dependent variable equals one if a game's ESRB rating is the same as the ESRB rating of the publisher's next most recent game. The first explanatory variable is the fraction of all other games released by the publisher with the same ESRB rating as the game. Given the results regarding age appropriateness specialization found in table 2, we expect this to have a positive effect. In addition, we include the fraction of the publisher's previous five games with the same ESRB rating. This would be positive if, in addition to the effect from all games, the most recent experience has even greater influence on game attributes. Indeed, the estimated coefficient on the past five games is positive and significant for ESRB ratings and for genres but is not significant for consoles. These results are indicative of a degree of increasing returns to specialization in horizontal attributes.

In the fourth column, we investigate specialization in vertical attributes with an OLS regression of a game's Gamespot score on the publisher's average Gamespot score and on the

publisher's average Gamespot score over the previous five games. The positive and significant coefficient estimate for the first variable is consistent with the existence of vertical specialization. However, the lack of significance on the second coefficient estimate fails to confirm increasing returns to quality specialization.

B. Do Game Consumers Substitute Across Niches?

To identify the importance of niches, we estimate the demand for video games with special attention to measures of product differentiation and the attributes of currently popular games. As discussed above, our data includes unit sales but does not include price data. Instead, we exploit how game quality and age affect game sales. Much like movies and music, the price of video games appears to bear only a slight association with its popularity. There is anecdotal evidence that games that are considered to be higher quality sell many more units, all else equal (Zhu and Zhang, 2010). At the same time, a typical game will have its largest sales in the week of its release, with unit sales decreasing steadily with weeks since release. Thus, we exploit the variation in both game quality and the age of video games to identify substitution across games.

We build up a more intricate specification of demand so as to uncover ever more subtle substitution effects. We, relate week-to-week sales of a game title to both own game values of age and quality and to values for competing games where competition comes from other games with similar horizontal features.

Our specification relates sales to its quality and age and the average age and quality of other current games. Niche related substitution patterns are examined by adding niche based variables for the age and quality measures for other games. The quality and age of other games is

averaged over all top 50 games currently sold. For both quality and age, we add three measures in which quality and age variables averaged only over the other games with the same ESRB rating, the same console, and the same genre. This results in the following specification:

$$Sales_{it} = \alpha^{own} Qual_i + +\beta^{own} Age_i + \alpha^{oth} AvgQual_{-it} + \beta^{oth} AvgAge_{-it}^{oth} + \gamma X_{it} + \Sigma_N \left(\alpha^{othN} AvgQual_{-i}^{othN} + \beta^{othN} AvgAge_{it}^{othN}\right) + \varepsilon_{it} \quad (1)$$

where *Qual* and *Age* refer to the own game and *AvgQual* and *Avg Age* refer to all other games. We hypothesize that α^{own} is positive and β^{τ} display a pattern as indicated in figure 2. We further hypothesize that all other current games are substitutes for the current game so that α^{oth} is negative and β^{oth} is positive. That is, when other games are better and newer, sales for any one game are smaller. In addition, *N* indexes the niches: ESRB, console and genre. We hypothesize that other current games within these niches are closer substitutes for the current game than are games outside of these niches implying an additional marginal effect of quality and age within niches beyond the general effect of quality and age of all other games. This implies that the coefficients, α^{othN} and β^{othN}, would be negative and positive respectively.

Our data set includes weekly sales of the 1,147 top 50 sellers for the 227 weeks beginning January, 8, 2005. We observe most games for multiple weeks before they fall from the top 50 sellers. This yields an unbalanced panel just over 8,000 game by week observations with positive sales. However, a game will continue to have positive sales even after it drops out of the top 50 sellers. For the subsequent weeks, we know that the game's unit sales are less than the sales of the 50th most popular game but we only observe positive game sales for games in the top 50. This results in game sales following a truncated distribution with sales always greater than the sales of the 51th game. Accordingly, we specify a model assuming sales are truncated at that week's

minimum sales (Green, 2012). Since many covariates only vary by game, standard errors are clustered at the game level.

Table 5 reports the results of various specifications of our truncated estimator of the determinants of the natural logarithm of unit sales. For all specifications we account for seasonality with 52 week dummies and a secular increase in the increased popularity of video games with a time trend. These are not reported but are jointly estimated to be significantly different from zero. Also, as expected the parameter sigma in the truncated regression is estimated to be different from zero in all our specifications indicating that a non-truncated normal distribution assumption would be inappropriate..

We begin with the most basic specification and systematically introduce regressors. In column 1, the only regressors are the game's GameSpot score and its age in weeks. As expected, sales are higher for games deemed to be of higher quality and are lower as games age. Column 2 adds the average GameSpot score and age for all other games over that week's top 50 sellers. Consistent with competitive pressures, game sales are significantly lower when other concurrent games are of higher quality. These effects are large. An increase by one standard deviation in own and other GameSpot scores, 1.3 and 0.22 respectively, imply a 50% increase and a 70% decrease in sales respectively. While the age effect for other concurrent games is positive, indicating sales increase when other concurrent games are older, this is not significantly different from zero.

Next we investigate whether within niche substitution is stronger. Columns 3, 4, and 5 introduce variables that average GameSpot scores and ages for only games in the same niche as the dependent variable for each of ESRB, console and genre. When variables these three niches are introduced one at a time, the GameSpot scores coefficients are negative indicating stronger

substitution effects within the niche than across niches. The variables for age effects within niche are never significantly different from zero. In column 5, contrary to expectations, the age effect for games in the same genre is actually negative but not significant. Still, the total effect for games of the same genre, the sum of the coefficients for all games and the coefficient on same genre games, is greater than zero.

Finally, in columns 6, 7, and 8, we simultaneously include all niche variables for GameSpot scores, ages, and both. The GameSpot results indicate that the console based niche appears to have the greatest within-niche level of substitutability. The ESRB and genre niche related variables are estimated to be smaller and lose their significance, likely due to an overlap of games within our niche definitions. The age coefficient for the genre-based niche remains negative and now is marginally significant. However, the total effect based on the sum of the coefficients for all games and the same genre games remains zero.

To summarize, we take the evidence in table 5 as indicating that there is strong evidence of substitutability across the games currently available to consumers. A publisher releasing a game during a period in which many high quality games are already available will substantially depress sales. There is also some evidence for even stronger within-niche substitutability. This is strongest for games written for the same console. However, even then the negative coefficient for the GameSpot score all other games indicates that substitution occurs across consoles. While a game's sales fall with age at about 8% per week, there is little evidence that they are higher when other top sellers are older.

C. Do Game Publishers Time the Release of Games so as to Avoid Saturated Niches?

The above analysis indicates the importance of substitutability across games. It also suggests that it may be larger with product niches, especially within games written for the same console. A firm will have a comparative advantage in a subset of possible product characteristics. Consumers typically substitute mainly within a subset of product characteristics. Moreover, since the sales of the typical game decay quickly, the lifecycle of a typical game is fleeting. This implies that a firm releasing its game during a week when their niche is already relatively well served could lead to much lower overall sales. Publishers stand to increase their profits considerably by avoiding such opening weekends. To the extent that they can, it may be profitable to either speed up the game release date or delay the release.

We hypothesize that, in the weeks, and perhaps months, prior to game release, publishers become aware of the expected release dates of competitors. Give the rapid expected decay in sales indicated by figure 2, they may attempt to adjust their game release date so as to avoid periods with the fiercest competition. Later the information about the quality of these expected releases becomes more firm. At this time, it may become even more imperative to adjust the product launch

We test our hypothesis by relating the number of games released in a niche in a week to the entry of games in that niche in the previous week. We model the number of releases as a negative binomial regression equation from a balanced panel of week by niche observations:

$$Releases_{nt} = \exp\left(\beta Releases_{n,t-1} + \gamma X_{nt} + \varepsilon_{n,t}\right).$$

If publishers are aware of the expected competition, we would expect some form of coordination on release dates, either tacit or explicit. This would imply that fewer games will be released in a niche in weeks when the previous week saw more games released in that niche so that we test

wheter $\beta < 0$. Our controls, *X*, are related to other factors that may shift the distribution of game releases in a week. Some niches are more popular than others necessitating dummy variables for each niche. Furthermore, there is evidence that some niches became more or less popular over the sample period, especially consoles. To account for this, we also include niche by year dummy variables. Finally, because game sales are highly seasonal, we include 52 week dummy variables.

The results of these entry regressions are reported in table 6. Overall, we only find support for our hypothesis for competition between games for same consoles. We find a significant negative impact on the number of games released in the current week stemming from either the number of released games for the same consoles released in the previous week in column 2 or a high share of games in the top 50 for the same consoles in the previous week in column 4. For the niches of age appropriateness and genre, however, we find no significant effect. This suggests that coordination of release dates within console systems is more important than for the other two niches. This conforms with the substitutability results from table 5. As for the model specification, the distribution parameter alpha turns out to be significantly different from zero strengthening our choice of a negative binomial compared to a Poisson model to estimate the data generating process.

IV. Conclusion

While the video game industry is rapidly growing in importance, it is only beginning to be studied academically. It shares a number of features with other entertainment goods like movies, music, and books. There is a steady stream of new products. There are substantial upfront costs in production. Consumers have strong preferences for new releases and consumers have

heterogeneous preferences for highly differentiated products. Within this context, one of the many strategic choices publishers must make is when to release a game.

We demonstrate the importance of product niches to understanding outcomes in this industry. We also suggest that the form of competition stems from the characteristics embodied in the games rather than on direct prices. This information indicates that the release date decision could have large profit implications depending on the level of competition in the publisher's product niche. Our results suggest that firms adjust their release dates so as to avoid periods of fiercest competition.

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Figure 1

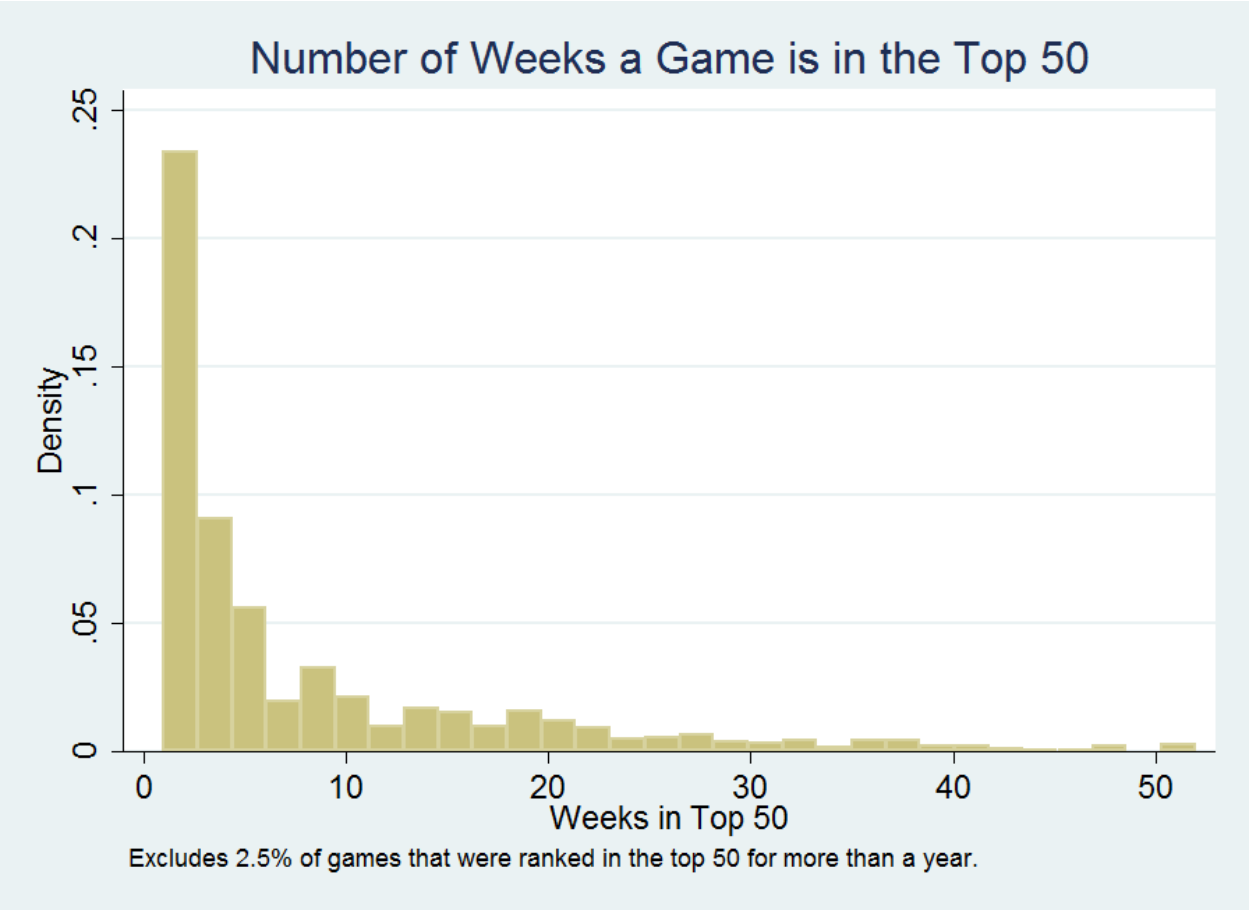
Number of Weeks a Game is in the Top 50
Density
0
.05
.1
.15
.2
.25
0
10
20
30
40
50
Weeks in Top 50
Excludes 2.5% of games that were ranked in the top 50 for more than a year.

Figure 2

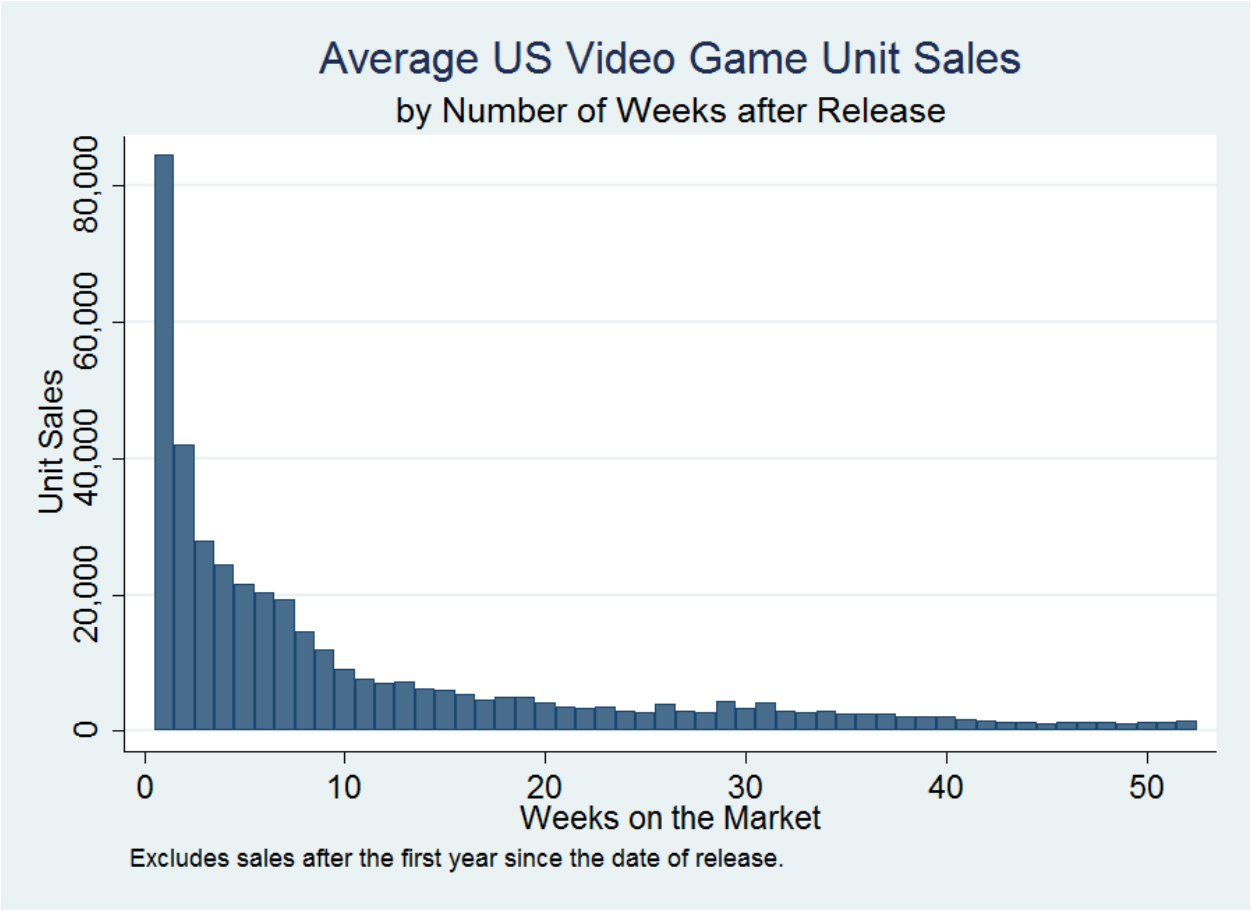
Average US Video Game Unit Sales
by Number of Weeks after Release
Unit Sales
0
20,000
40,000
60,000
80,000
0
10
20
30
40
50
Weeks on the Market
Excludes sales after the first year since the date of release.

Figure 3

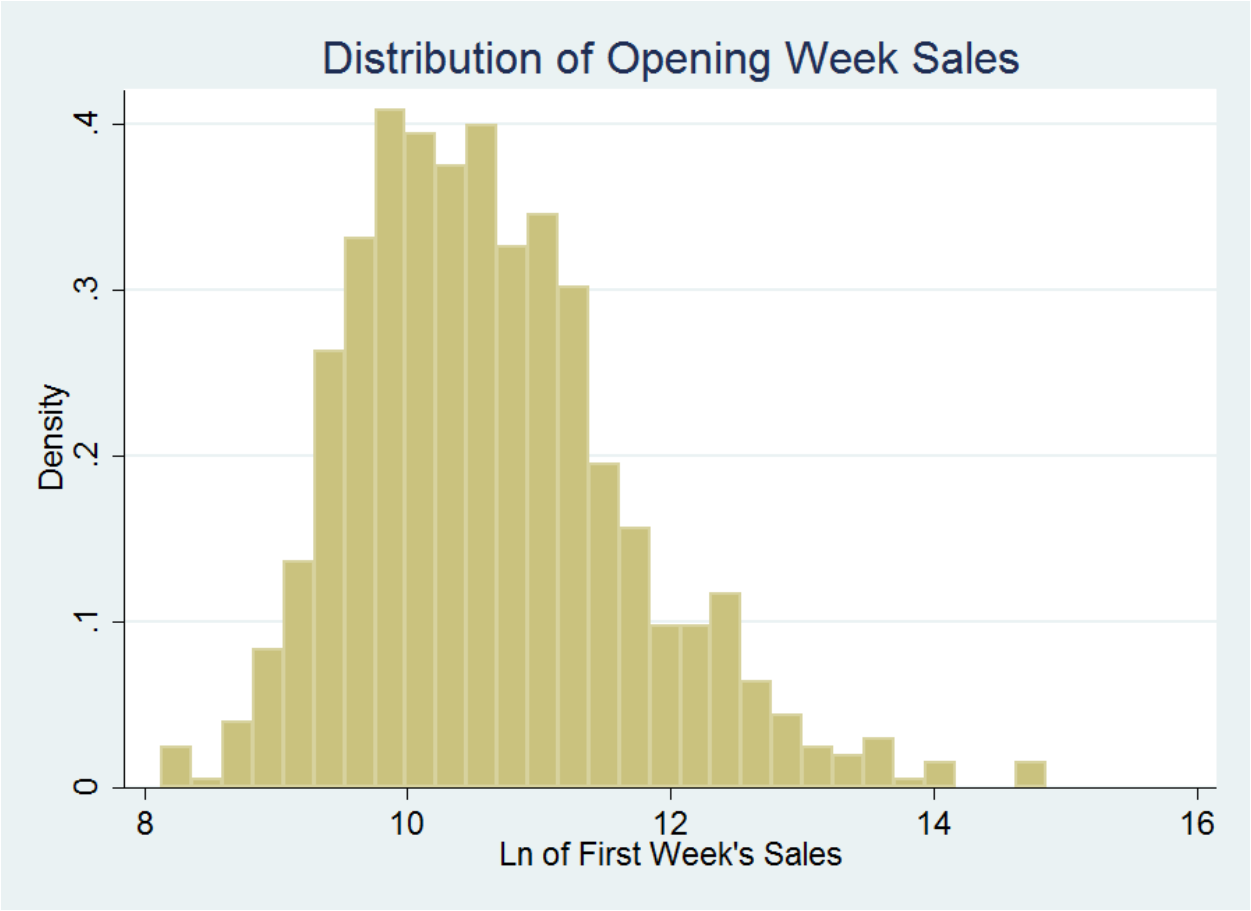
Distribution of Opening Week Sales
Density
0
.1
.2
.3
.4
8
10
12
14
16
Ln of First Week's Sales

Table 1. Specialization into Horizontal Niches by Developers

	ESRB				Console						Genre								
Developer	E	E10	T	M	DS	PS2	PS3	PSP	Wii	X360	Action	Edu/Puz	Platform	Party	RPG	Shooter	Sports	Strategy	Total
Activision	2	9	50	12	11	13	13	4	10	22	15	0	7	15	14	15	7	0	73
Amaze	3	6	2	0	5	4	0	0	2	0	7	0	2	0	1	1	0	0	11
Capcom	4	2	11	10	7	2	3	7	3	5	7	0	2	1	15	2	0	0	27
EA	110	26	35	13	13	43	33	23	19	53	5	2	2	2	23	13	134	3	184
Harmonix	0	0	14	0	0	5	3	0	2	4	0	0	0	14	0	0	0	0	14
Koei	0	1	12	3	1	1	4	1	0	9	12	0	0	0	3	0	1	0	16
Konami	6	11	4	8	8	8	1	6	4	2	2	2	2	11	9	0	1	2	29
Midway Games	2	0	6	7	0	4	3	1	1	6	6	0	0	0	0	3	6	0	15
Namco Bandai	12	1	9	2	5	2	2	4	6	5	7	4	0	2	5	0	6	0	24
Nintendo	36	6	5	0	30	0	0	0	17	0	1	11	5	8	8	2	6	6	47
Sega	9	4	8	5	2	4	6	0	7	7	5	1	5	1	7	0	7	0	26
Sony Computer	23	1	16	7	0	14	11	21	1	0	3	1	1	5	7	8	21	1	47
Square Enix	3	11	8	1	9	5	0	4	2	3	0	1	0	0	16	1	2	3	23
THQ	14	0	6	4	4	7	3	2	1	7	0	0	3	1	4	2	13	1	24
Take-Two	28	10	6	13	3	12	10	7	5	20	2	1	0	2	13	1	35	3	57
Ubisoft	8	5	24	16	8	5	10	1	8	21	6	1	2	6	19	12	4	3	53
Warner Bros.	1	14	1	0	3	2	2	2	3	4	3	0	0	0	13	0	0	0	16
Yuke's	0	0	17	1	0	5	3	3	2	5	0	0	0	0	0	0	18	0	18
Total	261	107	234	102	109	136	107	86	93	173	81	24	31	68	157	60	261	22	704
	χ^2 = 404.0 [P=0.00]				χ^2 = 325.3 [P=0.00]						χ^2 = 792.3 [P=0.00]								

The sample includes all developers with more than 10 games in the VGChartz data from 2005 through 2008.

Table 2. Specialization into Horizontal Niches by Publishers

	ESRB				Console						Genre								Total
	E	E10	T	M	DS	PS2	PS3	PSP	Wii	X360	Action	Edu/Puz	Platform	Party	RPG	Shooter	Sports	Strategy	
Activision	6	22	69	11	13	32	14	5	17	27	23	0	9	27	21	18	10	0	108
Atari	4	1	10	4	2	7	2	2	1	5	9	2	0	2	2	3	1	0	19
Atlus	0	3	8	3	7	5	0	0	1	1	3	0	0	1	7	0	0	3	14
Capcom	5	3	12	11	8	2	4	7	5	5	7	0	2	0	19	3	0	0	31
Disney	14	3	8	0	10	5	2	1	4	3	4	3	1	3	12	0	2	0	25
Eidos Interactive	2	1	7	7	2	4	2	2	0	7	0	2	0	0	9	5	0	1	17
EA	120	28	55	17	18	56	35	25	26	60	7	2	4	12	33	18	140	4	220
Koei	0	1	12	0	0	2	3	1	0	7	11	0	0	0	1	0	1	0	13
Konami	2	9	6	12	6	7	2	8	3	3	2	0	2	10	12	0	1	2	29
LucasArts	2	15	15	0	6	8	3	5	4	6	9	1	0	0	15	5	0	2	32
Microsoft	3	3	7	14	0	0	0	0	0	27	1	0	1	3	12	6	3	1	27
Midway Games	6	0	6	10	1	4	4	3	3	7	7	0	0	2	1	6	6	0	22
Namco Bandai	9	2	22	3	4	8	4	8	5	7	14	3	1	2	8	1	7	0	36
Nintendo	64	11	7	0	54	0	0	0	28	0	4	16	8	14	17	4	12	7	82
Sega	15	11	24	12	9	6	11	3	15	18	21	1	10	2	12	2	13	1	62
Sony Comp Ent	30	9	24	14	0	24	21	32	0	0	6	2	7	5	11	17	28	1	77
Square Enix	3	13	17	2	15	6	0	7	3	4	0	0	0	0	29	1	0	5	35
THQ	26	1	25	7	10	16	7	5	5	16	1	0	5	1	13	3	34	2	59
Take-Two	34	10	11	20	5	14	15	6	7	28	6	1	0	2	17	5	41	3	75
Ubisoft	15	10	29	26	14	8	13	2	14	29	8	4	2	8	26	19	10	3	80
Vivendi	3	4	2	8	4	3	2	2	2	4	6	0	2	0	5	3	0	1	17
Warner Bros.	2	6	0	4	2	1	3	1	2	3	0	0	0	0	6	4	2	0	12
Total	365	166	376	185	190	218	147	125	145	267	149	37	54	94	288	123	311	36	1,092
	χ^2 = 450.8 [P=0.00]				χ^2 = 571.1 [P=0.00]						χ^2 = 846.6 [P=0.00]								

The sample includes all developers with more than 10 games in the VGChartz data from 2005 through 2008.

Table 3. Specialization into Vertical Differentiation

Regression of GameSpot Score on Firm Dummies

Developers			Publishers		
	Coef.	Std. Err.		Coef.	Std. Err.
Activision	0.400	(0.416)	Activision	0.556**	(0.207)
Amaze	0.804+	(0.437)	Atari	0.412	(0.346)
Capcom	1.223*	(0.477)	Atlus	1.006**	(0.376)
EA	0.955*	(0.422)	Capcom	1.224**	(0.277)
Harmonix	1.800**	(0.554)	Disney	-0.340	(0.376)
Koei	-0.206	(0.514)	Eidos	0.293	(0.346)
Konami	0.832+	(0.473)	EA	0.829**	(0.187)
Midway Games	0.271	(0.527)	Koei	-0.978**	(0.376)
Namco Bandai	0.884+	(0.499)	Konami	0.923**	(0.283)
Nintendo	1.353**	(0.455)	LucasArts	0.303	(0.280)
Sega	-0.052	(0.485)	Microsoft	0.781**	(0.294)
Sony Computer	1.710**	(0.454)	Midway	-0.358	(0.308)
Square Enix	0.639	(0.485)	Namco	0.670*	(0.277)
THQ	0.484	(0.499)	Nintendo	1.060**	(0.218)
Take-Two	1.150**	(0.443)	Sega	0.010	(0.233)
Ubisoft	0.963*	(0.450)	Sony Comp	1.454**	(0.221)
Warner Bros.	0.531	(0.514)	Square Enix	0.866**	(0.264)
Yuke's	0.528	(0.504)	THQ	0.388	(0.238)
			Take-Two	1.004**	(0.218)
			Ubisoft	0.628**	(0.223)
			Vivendi	0.124	(0.355)
			Warner Bros.	-0.063	(0.419)
Constant	6.500**	(0.411)	Constant	6.563**	(0.166)
R^2	0.10			0.13	

Dummies are for firms if they have more than 10 games in the sample. The constant term represents the average Gamespot score for the other firms. 1,029 observations with valid Gamespot scores.

Standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.10.

Table 4. Tests of Increasing Returns to Specialization

	Logit			OLS
VARIABLES	Same ESRB As Last Game	Same Console As Last Game	Same Genre As Last Game	GameSpot Score
Fraction of All Other Games by Publisher with Same ESRB	3.227**			
	(0.417)			
Fraction of Previous Five Games by Publisher with Same ESRB	0.798*			
	(0.314)			
Fraction of All Other Games by Publisher for Same Console		5.583**		
		(0.620)		
Fraction of Previous Five Games by Publisher for Same Console		0.972		
		(0.606)		
Fraction of All Other Games by Publisher for Same Genre			3.117**	
			(0.592)	
Fraction of Previous Five Games by Publisher for Same Genre			0.951**	
			(0.328)	
Average GameSpot Score for All Other Games by Publisher				0.754**
				(0.112)
Average GameSpot Score for Previous Five Games by Publisher				0.104
				(0.101)
Constant	-1.615**	-2.845**	-1.428**	1.006+
	(0.177)	(0.158)	(0.226)	(0.517)
Observations	959	959	959	839

Robust standard errors in parentheses
** p<0.01, * p<0.05, + p<0.1

Table 5: Substitution between Niches – Truncated Regression of weekly unit sales by game

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gamespot Score (GSS)	0.435**	0.532**	0.570**	0.561**	0.557**	0.583**	0.538**	0.582**
	(0.110)	(0.113)	(0.116)	(0.122)	(0.111)	(0.116)	(0.119)	(0.121)
Gamespot Score (GSS) for all other games		-2.301**	-1.938**	-1.622**	-1.753**	-1.300**	-2.288**	-1.341**
		(0.475)	(0.470)	(0.451)	(0.471)	(0.473)	(0.463)	(0.469)
GSS for all other games with same ESRB			-0.149*			-0.073		-0.072
			(0.074)			(0.074)		(0.073)
GSS for all other games for same console				-0.261*		-0.211*		-0.216*
				(0.105)		(0.107)		(0.108)
GSS for all other games for same genre					-0.172+	-0.088		-0.063
					(0.098)	(0.094)		(0.093)
Age of game (weeks)	-0.074**	-0.081**	-0.083**	-0.082**	-0.079**	-0.082**	-0.081**	-0.081**
	(0.014)	(0.015)	(0.014)	(0.016)	(0.016)	(0.015)	(0.016)	(0.016)
Age for all other games		0.014	0.004	0.005	0.016	0.003	0.015	0.008
		(0.020)	(0.021)	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)
Age for all other games with same ESRB			0.010				0.014	0.012
			(0.009)				(0.011)	(0.010)
Age for all other games for same console				0.003			0.004	0.003
				(0.008)			(0.008)	(0.008)
Age for all other games for same genre					-0.012		-0.016+	-0.017+
					(0.010)		(0.009)	(0.010)
Sigma	1.407**	1.503**	1.493**	1.489**	1.499**	1.491**	1.488**	1.477**
	(0.096)	(0.110)	(0.107)	(0.109)	(0.110)	(0.108)	(0.105)	(0.104)

Robust standard errors in parentheses ** p<0.01, * p<0.05, + p<0.1

Table 6: Negative Binomial Regression for Niche Entry

	(1)	(2)	(3)	(4)	(5)	(6)
	ESRB	Console	Genre	ESRB	Console	Genre
Lag Niche Entry	0.004	-0.089*	0.046			
	(0.021)	(0.036)	(0.033)			
Lag Niche Share of Top 50 Games				-0.472	-2.409**	1.042
				(0.572)	(0.637)	(0.883)
Niche dummies	X	X	X	X	X	X
Year*Niche dummies	X	X	X	X	X	X
Week dummies	X	X	X	X	X	X
Ln(alpha)	-0.894**	-1.613**	-0.619**	-0.888**	-1.635**	-0.622**
	-0.158	-0.235	-0.151	-0.157	-0.239	-0.152
Observations	904	1,356	1,808	904	1,356	1,808

Standard errors in parentheses. ** p<0.01, * p<0.05, + p<0.1