

Does saturation of the mobile games market affect video game sales?

Qihuan Aixinjueluo

Weber State University

## Abstract:

In this research, I tried to find out whether the saturation of the mobile games market would make the sales of video games to increase or decrease. I used two separate regressions to analyze the long-term effect and the short-term effect respectively. My result shows that the size of the mobile games market has no significant influence over video game sales both in long terms and in short terms. Therefore, game producers can transplant their video games to mobile devices without worrying their video game sales to be shrinking.

## Background:

Nowadays, gaming has been an important way for people to enjoy their free time and socialize with their friends. That has made gaming a popular entertainment industry with a huge market. Speaking of revenue, the gaming industry has made more money than movie industry. Take the US as an example; in 2016, games had a revenue of 30.4 billion dollars according to “The Entertainment Association”(2016) while the total box office revenue was only 11.6 billion dollars according to “Box Office Revenue in North America from 1980 to 2017”(2017) (see Figure 1). Usually the gaming industry is divided into three parts according to what platform or what hardware people use to play games: console gaming, PC gaming, and mobile gaming. Among the three of them, PC and console gaming are traditional gaming forms with a history of over 30 years. Mobile gaming is the newest and the most influential gaming form, people play games on their mobile devices like smart phones and tablets. In the past, the size of mobile devices greatly limited the capability and function of carrying complicated games. Therefore, mobile gaming was not popular at that time. With the improvement of technology, mobile gaming has been increasing in popularity thanks to the high ownership rate of more powerful mobile devices and the ability to use small fragments of time for gaming. Many famous game

companies like EA have also tried to catch the opportunity and grab some share in the increasing market. According to the report from “2017 Year in Review” (2017) the revenue of the whole gaming industry worldwide has increased to 108.4 billion dollars. Mobile gaming was the biggest sector in the game industry with a revenue of 59.2 billion dollars, higher than both PC gaming and console gaming (see Figure 2). For the gamers, they have limited money and time that can be spent on playing games. It is interesting to know during the development of the mobile game market whether players would change their gaming behaviors. Would players stop playing on consoles and PCs and play games on their phones and tablets instead? As a result, will the sales of video games be negatively related to the saturation of the mobile game market?

#### Literature Review:

For now, academic research about video games is not very sufficient. Much of the research is focusing on what effect video games have on people about their economic output, crime rate, and mental development (MacDonald, 2016, p. 34-57). Also, some research is focusing on the platform strategy in the video game industry (Gretz, 2010, p. 81-94). In this literature review, I will be focusing on the articles that investigate what factors will have influence over video game sales. These articles greatly helped me to know the industry and develop the hypothesis of my research question.

The difference between mobile games and video games is not only about the hardware; it is also about the software. Laura and Frans (2005) argue that in the game industry, players should be more involved in the process of designing. Due to the difference in the hardware and the mobility of the mobile devices, games on mobile devices are not simple transplantations of video games. They are designed differently. Several academic papers, discussed below, have tried to investigate which kind of software and hardware can be more profitable on the market. I

think that these papers offer a good insight and prediction of whether mobile gaming is more competitive than video gaming by comparing both software and hardware of mobile games.

Cox (2013) has compared the sales of video games. He put the video games together and tried to find out which factors have the most important effect over the sales of video games. He found out that game quality and publishers are the most significant factors that can predict whether a game can sell well or not. Games from big and well-known companies are more likely to sell better than the games produced by small companies or individuals. Richard Gill and Frederic Warzynski (2013) got a similar result. They found out that vertically integrated games, or in other words games produced by bigger companies, can sell better and at higher prices primarily thanks to their better market strategy.

As for the hardware, Richard T. Gertz did research in 2010 trying to find out which factor plays a more important role in deciding the market share of game consoles: hardware quality or the network size. His result was hardware quality plays a more important role than network size, which means the market share of game consoles is more sensitive to hardware quality comparing to the network size. But if we consider mobile devices as another form of gaming consoles, the network size of mobile devices is significantly larger than the network size of existing game consoles. Even though the capacity of mobile devices may still not be as good as game consoles, they can still achieve considerable gaming market share.

Few papers discussed about the effect mobile games have on console games. However, there are several studies of other industries that have examined the relationship between traditional vendors and online competitors. Nguyen, Dejean, and Moreau (2013) investigated what effect online music streaming has on CD sales and their result showed that music streaming does not have a significant negative effect on CD sales and even positively affects live music

attendance. Similar result was yielded by Chris Forman, Anindya Ghose and Avi Goldfarb (2008). They found when there are local stores available, people will be less sensitive to online discounts. Both examples show that consumers might stick to old forms of shopping and consuming even when a powerful and convenient new platform is put forward.

Only one paper I found that looked into the relationship between mobile gaming and video gaming economically was written by Shinichi Yamaguchi, Kotaro Iyanaga, Hirohide Sakaguchi, and Tatsuo Tanaka (2017). Their result is that mobile games have a significant substitute effect over the handheld consoles, while for home consoles like PS3, the substitute effect is very small. Their research gives me lots of insights, but it still has some limitations. First, the research only focused on the Japanese game companies and using data in Japan. Second, the data used for the research was collected in the 13 months from August 2014 to August 2015. The mainstream of the gaming consoles on the market were still the 7<sup>th</sup> generation of game consoles (including Nintendo Wii, Sony PS3, and Microsoft Xbox 360), while now the mainstream game console market is comprised of 8<sup>th</sup> generation consoles (including Nintendo Switch, Sony PS4 and Xbox One), thus their research results may be out dated. Furthermore, it is hard to find the substitute effect because a significant number of mobile games on the market are freemium games (free to play but have to pay access to some of the additional functions inside the game), making it very difficult to identify particular prices of mobile games. The cost of playing freemium games can be very flexible and highly dependent on the players' individual gaming behavior. Therefore, for my research, I will include more updated data, a longer time period and another model to suit the market better.

Overall, for now the research about relationship between mobile gaming and console gaming is limited and cannot accurately reflect the latest market while for both mobile game

producers and console game producers, it is important to know what their target audiences are after a comparison of the complete mobile game market has been established. Moreover, for some companies hesitating whether they should transplant their games to other gaming platforms, this research should also be a good reference.

Theory:

In this article, I want to test whether a more saturated mobile game market will decrease the demand for video games. I would like to apply the theory of substitute goods and compliment goods in my research. In this theory, if two products work as substitute goods, the decrease in price of one of the two products will cause that products' quantity demanded to increase and result in a decrease of the quantity demanded for the other product. If two products work as compliment goods, the decrease in price of one of the two products will cause that products' quantity demanded to increase and therefore an increase of the demand for the other products.

Traditional video games require people to spend hours sitting in front of their consoles, and they have to spend money on their hardware before they really get into gameplaying. Time consumption, complex operation, and hardware cost make up the entrance barrier that prevents people from playing games on consoles. However, mobile gaming gets rid of these problems. people do not have to spend extra money for hardware. Most mobile games adopt the freemium business mode which does not charge customers for entrance. Craig Heier (2015) states that mobile game players tend to be more apprehensive towards purchasing an app or a game if they are unable to trial it beforehand. Also, mobile games are designed to be simple and can be played with short time fragments like waiting for buses or even waiting for elevators. So, I think comparing to video games, mobile games are less costly both in money and time. We can think

of the increasing choices of the mobile game market as the decrease of the price of the mobile game market overall.

Because consumers have limited time and money, it is possible that the mobile games and video games work as substitute goods if the group of customers and the resources they plan to spend on both game types are overlapped. With increasing saturation of the mobile game market, which we can recognize as an increase of the supply of the mobile games market and decrease of the price of the mobile games, there should be an increase of the quantity demanded for mobile games. Increasing demand results in a rise in the time and money spent on mobile games and therefore a decrease demand in console games, resulting in a decrease in the sales in the video game industry.

However, it is also possible that the two types of game act as compliments. According to the theory of compliment goods with the saturation of the mobile game market, the increase of the quantity demanded of mobile games caused an increase of quantity demanded of console games and finally an increase of the sales of the market. One possibility that would lead to a complimentary relationship is if original video game players tend to play mobile games without sacrificing the time and money they used to spend on playing video games.

A perhaps more likely possibility that would lead to a complimentary relationship is the saturation of mobile game market develops its own group of players that is different to the group of customers on the demand side of the video game market. I think there is a big potential market for gaming and the low entrance barrier can greatly encourage non-players into game playing and encourage players to play games with time that they originally did not use for gaming, which will not compete for limited resources with video games. Furthermore, mobile games might introduce games to non-players and change their consumption concepts about games. For

example, if someone starts with playing *Fortnite* on mobile phones and find the game fun to play, he/she will have a higher possibility to also try it out on PC or on console. In that case, mobile games may also play as a complement for video games. Therefore, my hypothesis is that the saturation of the mobile game market will not have a significant negative effect over video game sales.

#### Data description:

I have different models for my two different regressions. For my first regression I used data only in 2014 and 2017. While in my second regression, I used data from 2014 to 2017 including data in 2015 and 2016. In both of my models, my dependent variable is the sales of the video game industry by genres in USA, more specifically the weekly sales of shooter games and sports games. This sales data is generated by [vgchartz.com](http://vgchartz.com) and estimated by using the top 30 sold games' sales, which usually makes up more than half of the total video game sales. Video games sales here count all the revenue of the games available on consoles. important consoles include PS4, Nintendo Switch, Xbox One, Nintendo 3DS and PSV. We do not count the sales of games on personal computers and mobile phones here.

My focus independent variable is two dummy variables for my first regression. One keeps track of the time period and the other keeps track of the genre. If the time is in 2014, the time dummy variable will be 0 and if the time is in 2017, the time dummy variable will be 1. Also, if the observation is about the shooter games revenue, the genre dummy variable will be 0 and if the observation is about the sports game revenue, the genre dummy variable will be 1. In my second regression, I used another dummy variable named *greater*. When there are more sports mobile game than shooter mobile game coming out in the given week  $t$ , the dummy



variable's value should be 1. otherwise the dummy variable should be 0. I will use two dummy variables genre and greater in my second regression.

I am using the shooter and sports games as my two genres because a big difference in the number of mobile games in these two genres is noticed. Both of them have relatively similar proportional AAA releases (AAA stands for the games produced by big and famous game companies and therefore expected to be high quality games). I have run an additional two-sample proportion Z test to show that from 2014 to 2017, there are significantly more sports mobile games released than shooter mobile games. I am using the number of the games released on the IOS platform by genre in 2014 and 2017 provided by metacritic.com.

For my control variable, I decide to use the US disposable personal income in my first regression. This data is from BEA. Disposable personal income is personal income minus personal current taxes. According to the BEA, the income includes not only the wages and salaries, but it also includes payment from interest and business ownership and other sources. This data is monthly and adjusted for inflation using the same method used for the video game revenue. Because it is monthly data and my observations are based on the week, I will use the monthly disposable personal income divided by four to estimate the weekly disposable personal income and use the ending day of the week to decide which month that week belongs to.

Results:

I ran a set of tests and regressions to find out whether there is a significant relationship between video game sales and size of mobile game market.

The first regression I wanted to test is in the long term, whether a bigger mobile game market would decrease the sales of video games. I used a difference in difference to test this, and

as a result, I had an interaction term in my model. I made my two time periods to be year 2014 and year 2017 because there were absolutely more mobile games in market in 2017 than in 2014. To prove there were more sports games than shooter games published in mobile game market between 2014 and 2017, I ran a two-sample proportion Z test. In the test I compared the proportion of shooter game and the proportion of sports game in all of the new mobile games published from 2014 to 2017. My null hypothesis is they have the similar proportion of sports games and shooter games among all the new mobile games published from 2014 to 2017 and my test statistic is 4.5578 with a p-value of  $p=5.17 \times 10^{-6}$ , so I can confidently reject the null hypothesis and conclude that sports games are significantly more than shooter games. Besides, previous research found out that there is a clear relationship between game genres and personality types (Peever, Johnson, & Gardner, 2012), meaning that players will stick to one certain genre of game of several genres of games in a period and do not easily change their preferred genres. Therefore, I can use sports game as my treatment group and shooter games as control group to develop my difference in difference model.

My model is  $S = \beta_0 + \beta_1 * \text{genre} + \beta_2 * \text{time} + \beta_3 * \text{time} * \text{genre} + \beta_4 * \text{disposable income} + \varepsilon$

In this model, S stands for sales. Genre and time are two dummy variables. When the genre is sports game, the genre variable is 1. when the genre is shooter games, the genre variable is 0. When the year is 2014, the time variable equals to 0. When the time is in 2017, the time variable equals 1. I also have an interaction term and a control variable of disposable income.

The regression result is shown in the table1. From the table, we can find out that the time period has a significant and negative relationship to sales of sports and shooter games, which means from 2014 to 2017 an average 1,269,769.3 fewer video games in sports and shooter genres are sold each week. However, the coefficient of genres and the interaction term is not

significant. Therefore, I can conclude that this model does not reveal that a game genre with relatively more new mobile games published would result in less video games to be sold comparing to a game genre with not as many new mobile games. Therefore, there is no evidence showing that an increase in the size of mobile game market can change consumers' behavior towards video games. Also, I found a positive and significant coefficient in my control variable indicating every billion additional disposable income in the United States would cause 4702 more video games to be sold each week on average. This is reasonable because we can assume that when people have more money, they will also spend more on video games.

I ran a similar model in order to find out whether there is a short-term relationship between mobile game market and video game sales. In words, I tested for when new mobile games come out, will that affect the following week's video game sales. So, my model is:

$$S_t = \beta_0 + \beta_1 * \text{genre} + \beta_2 * \text{greater}_{t-1} + \beta_3 * \text{greater}_{t-1} * \text{genre} + \varepsilon$$

In this model, I test for among two genres of games, whether there are more mobile games coming out in one of the two genres, will that increase the difference between the sales of video games of the two genres of games. I still use sports game and shooter game as my two genres.  $S_t$  still stands for the sales of this week, and  $\text{genre}$  is still a dummy variable that tracks the genre.  $\text{Greater}$  is another dummy variable that if there are more mobile sports games coming out last week comparing to the mobile shooter games, the value should be 1 and otherwise the value should be 0.

The regression result is shown in table 2, from the table both the  $\text{greater}$  dummy and the interaction dummy do not have significant prediction over the video game sales. There is no evidence showing that if there is more sports mobile game published in one week, there will be

fewer sports games to be sold the week after. Therefore, in the short term, I did not find any relationship between mobile game market size and video game sales.

#### Conclusion:

In this research, I analyzed whether a bigger mobile game market will decrease customers' willingness to consume traditional video games. I found that in both long term and short term, mobile game market does not have significant influence over the demand for the video games. Therefore, mobile games and video games do not work as compliments nor substitutes in the US market or in other words, there is no evidence showing that mobile games and video games are fighting for a same group limited resources. For example, mobile games and video games target at different groups of customers, or people are using different time for video gaming and mobile gaming separately.

However, my research has some limitations. Firstly, my research only used the data of the US while the biggest existing mobile game market is in Asia, so players in countries like China and Japan might behave differently. Next, according to previous research, mobile games have different influence over handheld consoles and home consoles. It is possible that in average the influence of mobile games is not significant, but it is significant for some specific video game categories. Furthermore, in my second regression, my R-square is very small, so that means my model cannot predict video game sales very precisely, and there should be some reason that can be used to explain why there are fewer copies of video games to be sold in 2017 comparing to 2014 but was not included in my model. Finally, game genre is not a perfectly objective factor. I used the game genre shown on metacritic.com, but it is possible that people will have different opinions over which genre should a game belong to.

Still, for video game producers, this research provides them incentive to transplant their games from consoles to mobile devices without worrying that this would cause a loss of their existing benefit. Recently, many famous game companies have already tried to transplant their video games to mobile devices such as Epic Game's *Fortnite* and Blizzard's *Diablo 3*. When Blizzard first announced that *Diablo 3* would be transplanted to mobile devices, many *Diablo 3* players did not like the idea. Now we know that existing video game players are not likely to be the main audience for the mobile games, so that might be the reason why game companies care less about the negative remarks.

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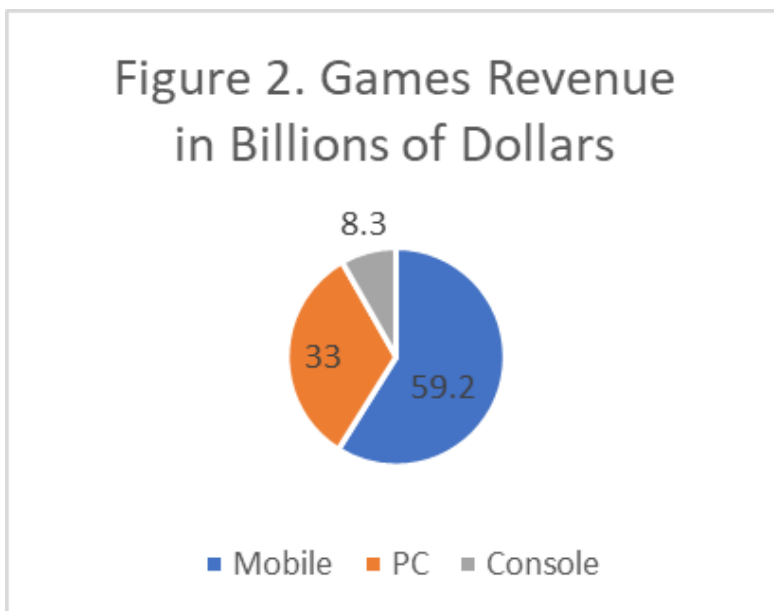
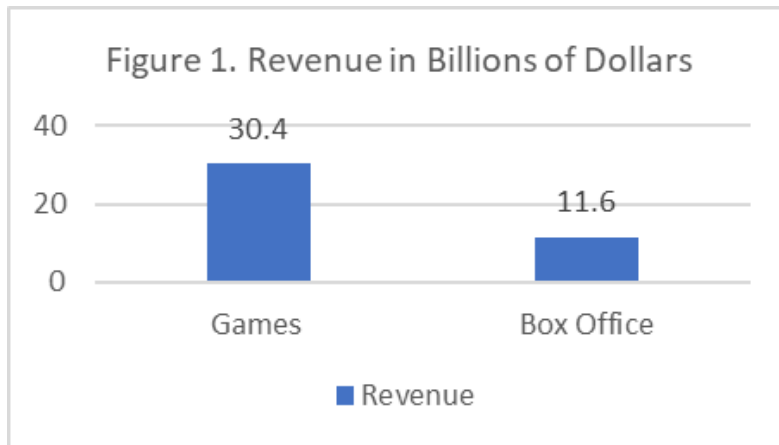
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Tables and graphs:



<i>Table 1</i>	Dependent variable		
	Sales		
Genre	-118467.0 (67833.8)	Observations	208
Time Period	-1269769.3*** (205192.9)	R-squared	0.2079
Interaction	-22365.2 (95931.5)	Adj R-squared	0.1923
Disposable income	4701.941*** (696.3)		
Cons	-14802157.0*** (2235514.5)		

Standard errors in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

<i>Table 2</i>	Dependent Variable		
	Sales		
Genre	-173248.4** (-3.00)	Observations	390
Greater	1808.2 (0.03)	R-squared	0.0375
Interaction	11128.0 (0.13)	Adjusted R-squared	0.0300
_cons	372165.8*** (9.13)		

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$