Korean Online Game's Platform Competition under Two-Sided Market Characteristic

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ABSTRACT

While the growth of total game market size slowed down and the arcade game industry started to shrink, the online game market keeps increasing, attaining 26.5% annual growth rate for the early 2010's. Korea's online game business is especially popular, so that the size is about US$ 4 billion, which is 64.2% of Korea's total game industry. In 2013, Game market size and online game market size were estimated to be about US$ 9 billion and US$ 7 billion, respectively. From a standpoint of sales, the game market in Korea (US$ 4.95 billion) accounts for 5.8% of the world game market and almost one third of the world online game market. Its growth rate is higher than that of the world game market. The online game markets in Korea and China have common characteristics that can be distinguished from other countries: two-sided market with very low switching costs. This paper is to study the important factors that affect Korean online game's platform competition. The authors empirically investigate network externalities by using various variables in online game industry in Korea. The authors found the number of games available in a platform positively affects its market share, while the diversity of games and generality of game rating had no significant impacts. The authors also found that multi-homing (or overlap of games) increases an online platform's market share when the platform is relatively new. However, multi-homing decreases market share when it becomes mature. Having done our empirical and academic analyses, the authors draw practical implications that may help decision makers in Korea's online game businesses.

Keywords: *Competition, Korean Online Game Market, Network Externalities, Online Game Platforms, Two-Sided Market*

INTRODUCTION

The global game market size is estimated at about US$ 85 billion as of 2010, which is 0.2% bigger than the previous year. Market shares of game industry are 39.8% for video game, 27.7% for arcade game, 18.8% for online game, 10.1% for mobile game, and 3.6% for PC game. While the total game market size growth is slowed down and the arcade game industry started to shrink, the online game is increasing dramatically, attaining 26.5% growth rate for 2010 (Korea Creative Contents Agency, 2011).

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In Korea, the game market size in 2010 is estimated about US$ 6.5 billion which has grown by 12.9% from 2009. Korea's online game is very popular, so that the size is about US$ 4 billion, which is 64.2% of Korea's total game industry. In 2013, Game market size and online game market size are anticipated to be about US$ 9 billion and US$ 7 billion, respectively. From a standpoint of sales, the game market in Korea (US$ 4.95 billion) accounts for 5.8% of the world game market and almost one third of the world online game market. Its growth rate is higher than that of the world game market (Korea Creative Contents Agency, 2011). Therefore, online game is one of the fastest growing industries in Korea.

Online game industry in Korea has the characteristics of two-sided market because online game platforms have two distinct user groups (gamers and game developers) that provide each other with network benefits. Until late 1990's, almost all online game developing firms had their own online game access portals. However, new type of online game portals that do not necessarily belong to game developing firms such as www.netmarble.net and www.hangame.com began to change the whole system. Through these portals, end users can play online games with just one ID, which is so convenient. Some portals became famous because they provided the access to many popular games. Now, it became the norm for end users to access to the games through this kind of complex online game portals. Game developers want to provide their games to online game platforms with large number of members in order to attract more users. Also, users want to visit the online game platforms which have more popular games. Therefore, Korean online game industry now has two-sided market structure.

This two-sided market characteristic of Korean online game may be found in other games markets such as video game market, PC game market, mobile game, and so on. However, there is one big difference between Korean online game industry and other typical two-sided markets: the switching costs between platforms for end users are very low. In video console game, users incur significant cost for switching from one console system to another because of the hardware costs and other inconveniences. Similarly, in mobile game market, if a user wants to change from iOS based games to Android based games, he or she needs to pay a substantial price to buy a new smartphone. Besides, many consumers purchase smartphones with multi-year contract, so that it may not be easy for them to switch to different OS based smartphones. Contrarily, the switching cost in Korean online game is much lower, because no hardware prices are involved. Just signing up for a new portal enables a user to switch.

Since the switching costs between the platforms are low, the business strategies of platform players should be different from those in other games markets. When switching costs are high due to expensive durable products or multi-year contract, a platform player is able to exploit locked-in consumers. It may charge high prices on the usage of games, while leaving only small margins to game developers. However, in Korean online game, price of the game usage would be almost similar across the platforms. Therefore, unlike other two-sided market studies that needed to consider (or should have considered) lock-in effects, our study is looking into the pure indirect network externalities from game developers to gamers.

Although two-sided market structure with low switching costs is not really common in other countries because gamers directly go to each game site, China has very similar online game structure as Korea. Therefore, our findings in this study may also be applied to China's online game market. Considering that china's fast growing online game market is the number one in the world, which takes 1/3 of the world's game market, our findings may have strong implications toward world game market.[1]

One of the reasons that Korea and China have similar structure in online game market is that early stage of China's online game market was led by Korean game developers during 1990's and early 2000's. The massively multiplayer online role playing games (MMORPG)

were especially popular both Korea and China. Now, Chinese local developers like TenCent, NetEase, Shanda Game, Perfect World, and Chang You are leading the market. However, their main competitors used to be Korean developers in early period in China, and their distribution or channeling policies became very similar to Korean companies' policies

Understanding the similarities between Korea's and China's online game market, research on one market may have implications to the other. In this paper, we focus on Korean online game market. We will analyze the various characteristics of two-sided market under low switching cost in Korea's online game market. We empirically investigate network externalities by using various variables in online game industry in Korea. The remainder of the paper proceeds as follows. In the next section, we overview the literatures to differentiate our work from previous studies and describe our hypotheses based on these literatures. Having done this, we outline the details of our model and data to help make the problem more concrete in the following section. Then, we present and discuss the empirical results followed by the concluding remarks.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

Since Katz & Shapiro (1985)'s study, network externalities have been one of the popular topics in the researches on IT industry. For instance, customers used to prefer IBM-compatible PC's to Apple computers because of their large number of users and applications. Brynjolfsson & Kemerer (1996) asserted that price of spread-sheet-software was higher when it was Lotus compatible due to strong direct network externalities. Also, Gallaugher & Wang (2002) argued that there were network effects in web server pricing in software markets.

The recent researches on indirect network externalities have been developed into "two-sided market." Two-sided markets are defined as markets in which one or several platforms enable interactions between two (or multiple) sides on board by appropriately charging each side (Rochet & Tirole 2006). For example, in credit card industry, credit card companies try to increase their credit card members by making as many contracts as possible with many merchants. Also, in mobile OS platform market such as iOS and Android, OS companies attract end users by inviting many application developers to their OS platform. Therefore, the ability to attract many complementary goods and manage complementary goods network is as important as the ability to provide excellent products (Cusumano & Gawer 2002; Srinivasan & Venkatraman 2010).

Early studies on two-sided market focused on the impact of one group's network size on the other group. For example, Gandal et al. (2000) studied the relationship between the sale of CD players and the number of available compact disk titles. Bakos & Katsamakas(2008) suggested a pricing model in two-sided markets. Clements & Ohashi (2005) and Prieger & Hu (2006) looked into the link between the sale of video game consoles and the number of available game titles. As the study proceeded, researchers started to consider not only the quantitative measures but also qualitative measures like multi-homing. Single-homing means that end users can only connect to one platform (Landsman & Stremersch 2011), hence, it might be easier for a platform provider to monopolize the market. Contrarily, multi-homing means that end users may stay with more than one platform in the user network. Therefore, in multi-homing situation, platform providers have to compete intensely with each other (Landsman & Stremersch 2011, Srinivasan & Venkatraman 2010). They assert that multi-homing has negative effect for platform market share. Choi (2010) show that multi-homing increases social welfare.

Until now, the most of the studied two-sided markets have one common characteristic; high switching costs between platforms. Users incur a lot of costs to switch from one platform to another. This is true for video game console, smartphone OS, and others. Therefore, network

effects interact with lock-in effects. If researchers do not explicitly consider the switching costs in their empirical model, the results might be biased toward incumbents. Contrarily, in online game industry in Korea, switching costs among platforms are almost negligible. We believe that this provides the condition that pure indirect network externalities between gamers and game developers can be studied.

In the researches for video game industry, Coughlan (2001) asserts that the number of games available for a console determines the greater part of a company's profit. Similarly, in online game industry, the number of available games titles in an online game platform attracts more end users and increases market share for the company. In other words, the network size of the game developers positively affects the network size of users. Therefore, to see the indirect network externalities, we posit the following hypothesis.

In previous studies, network effect is analyzed by the relationship between a company performance and innovations in many industries such as chemical industry or biotechnology industry (Ahuja 2000, Powell, Koput, and Smith-Doerr 1996). In the online game industry, the relationship means that online game portals have many product contracts with many online game developing companies, complementary goods producers. Therefore, in the researches for indirect network externality, the effect that the number of complementary goods has on a platform is analyzed as an independent variable:

H1: The number of games on a platform has positive impact on its market share.

However, the simple number of games may not truly reflect the various preferences of end users. For those who love action games, the large number of board games means almost nothing, no matter how big it is. Therefore, we need to consider the quality aspect of the network size of the games. Following Tanriverdi & Lee (2008), we use the number of genres available in a platform. In Korea, online game companies have developed from massive multiplayer online role playing game (MMORPG) and real time strategy simulation (RTS) to various genres such as sports, racing, and first-person shooter (FPS). Therefore, we introduce genre to capture the variety of the game titles in a platform.

We also need to consider the age restrictions allowed for the games. In general, online game is regarded as an entertainment for young people, and the majority of young people play online games (age 10~12: 87%, age 12~15: 95%, 15~18: 93%). In Korea, the age rating is arranged by Korea Media Rating Board (KMRB). This institution considers rating in relation to various factors such as violence, sexuality, etc. The lower the age rating is, the more people can play the game, and attract more users. Therefore, rating is to capture the generality of the game titles in a platform. To see the qualitative aspects of games titles, we assert H2 and H3 as follows:

H2: The variety of game genre on a platform has positive impact on its market share.

H3: The more generally rated games a platform provides, the bigger its market share will be.

In prior researches on two-sided markets, single-homing was considered as a differentiation or monopolization strategy for platforms. Podlny & Stuart (1995) argue that multi-homing would induce competition and thereby negatively affect the survival of firms, if they do have similar features. Srinivasan & Venkatraman (2010) also assert that games that can be played more than one console have negative impacts on sales of console. On the other hand, however, multi-homing is not necessarily bad. If a platform can provide popular games which have been serviced on other platforms, it would be useful to attract new users to the platform. Choi (2010) concludes that it is better to lead the market to multi-homing from single-homing for efficiency and social welfare. To see the impacts of multi-homing on firms' profitability in Korea's online game market, we claim H4 as follows:

H4: The greater the number of games which can be played on more than one platform, the larger the platform market share will be.

The online game platform firms want to host popular games to increase their market shares. Due to this kind of efforts, platform firms make contracts with popular developers and host various kinds of games from those popular developers. Therefore, it is worthwhile to analyze the impact of relationship between online game developers and platform companies on platform market share. In terms of graph theory and network analysis, this is a connection with high centrality vertex, which is supposed to have positive impacts. This issue has been studied previously by Oliver (1990), Podgorny (2001) and Srinivasan & Venkatraman (2010). We adopt measuring method of Srinivasan & Venkatraman (2010), and try to see how much online game platform relies on famous game developers. Hence we posit the following hypothesis:

H5: Having relationship with popular online game developers will increase the market share of an online platform.

Finally, we are going to analyze the moderation effect of platform age on H4. In indirect network externality studies, Landsman & Stremersch (2011) argue that the effect of multi-homing varies according to maturity of a company. They show that multi-homing negatively affects early platforms, but has positive impacts on mature platforms. Also, Srinivasan & Venkatraman (2010) discuss that platform age plays a moderator's role for the centrality of complementors. In the online game industry, similar effects might exist. Even in the online industry, depending on a time flow, end users may feel differently toward stability of online game platform. Whereas they may feel novelty for newness, they might feel fed up with old things. Namely, the effect of multi-homing on a platform may vary according to the level of the platform maturity. Accordingly, we suggest following hypothesis:

H6: Platform age has negative moderation effects on H4.

RESEARCH METHOD AND DATA

Research Model

We use the following regression equation model, and analyze it by using panel data linear regression fixed-effect model on Eviews 7.0:

$$\begin{aligned}&\log\left(platformmarketshare_{i,t}\right)=\alpha\\&+\beta\log\left(number_{i,t}\right)+\gamma\log\left(genre_{i,t}\right)\\&+\delta\log\left(overlap_{i,t}\right)+\zeta\log\left(rating_{i,t}\right)\\&+\eta\log\left(status_{i,t}\right)\\&+\theta\log\left(platformmarketshare_{i,t-1}\right)\\&+\lambda\log\left(platformage_{i,t}\right)+\mu\log\left(overlap_{i,t}\right)\\&\times\log\left(platformage_{i,t}\right)+\varepsilon_{i,t}\end{aligned}$$

We are going to show the result of fixed-effect model, because Hausman test rejected the hypothesis that there is random-effect. To avoid multi-collinearity problem, we do not include 'number' and 'genre' variable at the same time. Instead, either of two variables is alternatively analyzed.

One may note that there is no price variable in the regression equation. The reason is the access to the online game platform is free. Furthermore, almost all online games in Korea are free to access, i.e., users do not pay to play games. Only a few exceptional games like World of Warcraft (WoW) ask users to pay for the access. Instead, users pay for various game items. Since different games have different types of game items and moneys, we were not able to convert these charges into platform prices.

Also, contrary to our original thought that there will be seasonality due to school vaca-

tions, there were no significant differences after Tramo/Seats seasonal adjustment. Hence we analyze the data without seasonal adjustments. Finally, to feature out whether the result is driven by unobserved attributes or simultaneity, we conducted regression the dependent variable with lagged independent variables.

Platform Market Share

Dependent variable is platform market share. Since we do not have platform sales data, it is not possible to calculate the market share based on sales amount. Instead, we use the game portal traffic to measure the market share. The online game portal traffic can be respresented by number of unique visitor (UV) and total time spent (TTS). Because most online game portals have a structure in which user have to access, we believe that UV may be a good proxy for measuring the platform market share. Therefore, we are going to use UV as a dependent variable.

Number

'Number' refers to the number of ties between complementors (games) and platform. It is measured by the number of games that can be played on online game portal 'i' at time 't'.

Genre

'Genre' is to see the qualitative aspect of complementors. This is measured by the number of game genres that can be played on online game portal 'i' at time 't'. Following the classification of genres in www.gametricks.com, we use 9 game genres such as FPS[2], MMRPG[3], RTS[4], Gostop (Korean playing card game), Racing, Board, Sports, Arcade, and Poker.

Rating

'Rating' is measured by the average of age rating for games that are weighted by the population proportions. Suppose a portal provides game 1 for all ages, game 2 for age 12 and above, and game 3 for age 18 and above. Since the population proportion of all ages, 12 and above, and 18 and above in Korea are 1, 0.94, and 0.85, respectively, the average Rating will be (1+0.94+0.85)/3 = 0.93.

Overlap

'Overlap' refers to the proportion of games which are in multi-homing contract that can be played on online game portal 'i' at time 't'.

Developer Quality

'Developer quality ' is to see the impact of connecting to the popular game developers. It is measured by the average market share of online game developers. High value of 'Developer quality' variable means an online platform has contracts with popular developers. For instance, as of July 2009, in a platform "plaync" (www.plaync.co.kr), 90% were developed by NCSOFT which has 5% game market share, and 10% were developed by others. Also, in online game developing industry, the market share of NCSOFT is 5% and other companies are around 1%. In this case, ' Developer quality ' of www.plaync.co.krbecomes (0.05 * 0.9) + (0.01 * 0.1) = 0.046.

Platform Market Share at Time 't-1'

Although platform may not have direct network externalities, it might be possible that online game itself may have (Park 2008). Therefore, we use platform market share of the previous period, for the robustness check of our results in some regression equations.[5]

Data

Our data includes panel for 14 online game portals for 34 months (from July 2009 to April 2012). One portal started to operate from September 2009, another one from November 2009, and the third one from October 2010. Because of these three portals, the total number of observations becomes 523. We purchased the traffic data of online games from a marketing research company Nielsen- Korean Click. We also acquired other information such as the

rank of games, genre, etc. from an online game research company Game Tricks. We selected games serviced during this period, and online game portals in which users can play any game with only one ID. Since our dataset represent 95% of total online game portal market, there will be no sample selection bias. The descriptive statistics and correlation coefficients of variables are shown in Table 1.

RESULTS AND DISCUSSION

The regression results are shown in Table 2. We applied different combinations of variables to show the robustness of our results. In Model 1, 3, and 5, the coefficients of 'number' were positive and significant. Therefore, H1 was supported, i.e., the number of games on a platform that has positive impact on its market share. From the perspectives of two-sided market, we can claim that online game developers have positive indirect network effects on online gamers (users) through online game portals.

While H1 is about quantitative measures, H2 and H3 were to see the qualitative aspects of online game titles such as the variety or generality. Contrary to our original thought, H2 was not significant. The variety of game genres on a platform did not have positive impacts on its market share. We think this result is due to the fact Korean online game market relied heavily on MMORPG genre, which takes about 60%. In other words, it can be assumed that most of online game portal market share is influenced by MMORPG. Although there was a report that online game users tend to be evenly spread across all genres (Digital Times, 2003), Korea is still MMORPG dominant society. Thus, providing various game genres did not have significant effects to increase number of gamers in an online game portal.

H3, which is to see the impact of generality of game rating, was not significantly positive either. In case of model 2, it was even significantly negative. This shows that although an online game portal increases its accessibility to more general age audiences, the effect is not necessarily good for the firm. We speculate this result as follows: Firstly, ages 18 and above are major customers in online game market, so the age restriction is not a big problem for users. According to the statistics from Korea Creative Contents Agency (2011), ages under 18 are only 15% of entire users. Secondly, gamers may prefer violence and sexuality, so that age restriction might oppositely affect the market.

Table 1. Descriptive statistics and correlation coefficients

	Number	Genre	Rating	Overlap	Developer Quality	Age	Market Share
Number	1.00						
Genre	0.87	1.00					
Rating	-0.08	-0.05	1.00				
Overlap	0.54	0.56	-0.25	1.00			
Developer Quality	0.77	0.75	0.18	0.40	1.00		
Age	0.48	0.52	0.38	0.27	0.58	1.00	
Market Share	0.78	0.62	0.02	0.30	0.52	0.57	1.00
Mean	17.84	4.39	0.94	1.06	0.006	102.12	0.07
Std. Dev.	17.16	2.58	0.03	0.07	0.002	39.78	0.08
Observations	523	523	523	523	523	523	523

Table 2. Regression results of main model

	Model 1	Model 2	Model 3	Model 4	Model 5
number	0.73*** (0.15)		0.91*** (0.15)		0.42*** (0.14)
genre		-0.12 (0.16)		-0.03 (0.14)	
rating	0.06 (3.11)	-6.75** (3.13)	3.67 (2.98)	-3.68 (2.68)	-0.31 (2.65)
overlap	0.74 (1.03)	0.70 (1.05)	83.50*** (10.86)	39.66*** (11.07)	46.82*** (10.32)
age	-0.54 (0.18)	0.02 (0.15)	-0.47*** (0.17)	-0.08 (0.13)	-0.37** (0.16)
Developer quality	0.01 (0.18)	0.34** (0.17)	-0.02 (0.17)	0.19 (0.14)	0.03 (0.15)
overlap*age			-16.93*** (2.21)	-7.96*** (2.24)	-9.42*** (2.10)
Market share$_{t-1}$				0.43*** (0.04)	0.40*** (0.04)
constant	-2.92** (1.34)	-2.26* (1.36)	-3.77*** (1.28)	-1.02 (1.16)	-1.50 (1.16)
F	226.90***	216.49***	243.65***	299.00***	305.02***
R^2	0.90	0.90	0.91	0.93	0.93

Dependent variable: platform market share
Standard errors are in parentheses.
*, **, *** represent error rate 10%, 5%, and 1%, respectively.

Because of these reasons, online game firms develop more games targeting for adult users nowadays[6] (Etnews.com, 2012).

H4, which states that multi-homing has positive impact on a platform's market share, was significant. In model 1 and 2, which did not consider the moderation effect of platform age, the variable 'overlap' was not significant. However, once we include the moderating variable, it became strongly significant and positive in all of model 3, 4, and 5. Therefore, if we simply look at the coefficient of overlap variable, the result was opposite of prior researches by Podlny & Stuart (1995), Tanriverdi & Lee (2008), and Srinivasan & Venkatraman (2010) since they insisted the negative impacts of multi-homing. Contrarily, our result was closer to Choi (2010) that argued that multi-homing induces more consumers to the market.

However, the interaction term of overlap and age were all significantly negative in model 3, 4, and 5. This means that the positive effect of multi-homing strategy on a platform market share completely reversed once the platform becomes mature. This result may happen by the following reasons. When a platform is a fledgling, it can attract users by providing games which already have reputation and huge user bases. However, when platforms are mature, they do not have extra customers to attract by providing multi-homing strategy. Instead, they may lose users to young platforms which utilize multi-homing strategy. Abandoning effect becomes bigger than seizing effect for a mature platform. Hence H6 is supported.

H5 is to see the impact of having relationship with popular online game developers. In model 2 without the moderation effect, it was

significantly positive. In a model with moderation effect, it was marginally significant (with 20% error rate) and positive in model 4. In other models, the coefficients of 'Developer quality' were not significant. Since results are mixed, we conclude that H5 is partially supported. This result implies that an online game portal may attract extra end users through the contracts with popular game developers to increase the centrality of the network position. Nevertheless, this impact is marginal.

Regarding other control variables in the regression models, the age variable was significantly negative. This implies that being a mature online game platform does not guarantee the market position of online game portals. Online gamers easily switch to other platforms if other conditions are better. Finally, the previous period of online game platform market share was significant and positive, which confirms that online game portals have direct network externality caused by install-based online games.

Having done all the hypotheses tests, we need to check reliability of our results. First of all, one may wonder that whether the results are driven by unobserved attributes or simultaneity. For example, the significance of number of game (H1) is occured by the opposite causality, i.e., higher market share caused higer number of game. To minimize this possibility, we conducted regression with the lagged independent variables. The reason of using the lagged variables is as follows: Past may causes future, but not the other way round. Since the independent variables are lagged ones, it is not possible that the dependent variable (market share) causes the various independent variables.[7]

The results are in Table 3. Model 6 to Model 9 tell us that the results are quite similar with original models, except that genre became

Table 3. Regression results with lagged independent variables

	Model 6	Model 7	Model 8	Model 9
Number (-1)	-0.89*** (0.15)		0.42*** (0.14)	
Genre (-1)		0.25 (0.16)		-0.03 (0.14)
Rating (-1)	3.71 (3.04)	-1.70 (3.16)	-0.39 (2.67)	-3.80 (2.74)
Overlap (-1)	84.29*** (11.12)	80.19*** (12.15)	46.68*** (10.57)	39.36*** (11.32)
Age (-1)	-0.45** (0.18)	0.14 (0.15)	-0.37** (0.16)	-0.08 (0.13)
Developer quality (-1)	0.05 (0.18)	0.46*** (0.17)	0.10 (0.16)	0.27* (0.15)
Overlap(-1)*Age(-1)	-17.11*** (2.27)	-16.23*** (2.48)	-9.38*** (2.16)	-7.89*** (2.30)
Market share$_{t-2}$			0.39*** (0.04)	0.42*** (0.04)
Constant	-3.37*** (1.31)	-2.44** (1.33)	-1.1 (1.18)	-0.63 (1.18)
F	236.83***	220.9***	297.28***	291.48***
R^2	0.91	0.91	0.93	0.93

Dependent variable: platform market share
Standard errors are in parentheses.
*, **, *** represent error rate 10%, 5%, and 1%, respectively.

negatively significant in Model 9. This may indicate that causality direction is as we suggested in the model. Nevertheless, we are not able to completely rule out the endogeniety problem, which is one of the limitations of our study.

Another thing we need to check is that the results are driven just by size instead of network externalities. All others being equal, a platform that hosts more games are going to attract more consumers because simply there are more to choose from. So, the market share could increase without any network externalities. To rule out this explanation, we tried the regression with market share per game as a dependent variable (market share divided by the number of games available in a platform). This way, the scale effect will be pruned in the regression. The regression results are in Table 4 and we were not able to find big differences from the previous one. Therefore, we now have stronger argument regarding network externalities.

Now, Table 5 summarizes the results of hypotheses tests.

CONCLUDING REMARKS

We analyzed the important factors of two-sided market under low switching costs, which can be found in online game market of Korea and China. Therefore, this paper would help the readers understand the online game market characteristics and competition outcomes in Korea and China. We empirically investigate network externalities by using various variables in online game industry in Korea. We found the number of games available in a platform positively affects its market share, while the diversity of games and generality of game rating

Table 4. Regression results for market share per game

	Model 10	Model 11	Model 12	Model 13
Number	-0.08 (0.16)	-0.22* (0.13)		
Genre			-0.20 (0.16)	-0.30** (0.14)
Rating	3.67 (2.98)	0.06 (2.60)	2.79 (2.99)	-0.50 (2.61)
Overlap	83.50*** (10.86)	44.02*** (10.16)	79.21*** (11.49)	37.89*** (10.78)
Age	-0.46*** (0.17)	-0.32 (0.16)	-0.50 (0.14)	-0.44*** (0.13)
Developer quality	-0.02 (0.17)	0.03 (0.15)	-0.06 (0.16)	-0.06 (0.14)
Overlap*Age	-16.93*** (2.25)	-8.84*** (2.07)	-16.07*** (2.34)	-7.62*** (2.19)
Market share per game$_{t-1}$		0.42*** (0.04)		0.42*** (0.04)
Constant	-3.76*** (1.28)	-1.45*** (1.14)	-3.80*** (1.27)	-1.59*** (1.13)
F	89.47***	123.81***	89.76***	124.37***
R^2	0.79	0.84	0.79	0.85

Dependent variable: platform market share per game
Standard errors are in parentheses.
*, **, *** represent error rate 10%, 5%, and 1%, respectively.

Table 5.Summary of the hypotheses tests

Hypothesis		
H1	The number of games on a platform has positive impact on its market share.	Supported
H2	The variety of game genre on a platform has positive impact on its market share.	Not supported
H3	The more generally rated games a platform provides, the bigger its market share will be	Not supported
H4	The greater the number of games which can be played on more than one platform, the larger the platform market share will be.	Supported
H5	Having relationship with popular online game developers will increase the market share of an online platform.	Partially supported
H6	Platform age has negative moderation effects on H4.	Supported

had no significant impacts. We also found that multi-homing (or overlap of games) increases an online platform's market share when the platform is relatively new, but decreases market share when it becomes mature.

We derive the academic contributions of this study as follows. Korean online game industry has two-sided market characteristic with low switching costs. Since the switching costs between the platforms are low, the business strategies of platform players would be different from those in other games markets. When switching costs are high due to expensive durable products or multi-year contract, a platform player is able to exploit locked-in consumers. It may charge high prices on the usage of games, while leaving only small margins to game developers. However, in Korean online game, price of the game usage would be almost similar across the platforms. Therefore, unlike other two-sided market studies that needed to consider (or should have considered) lock-in effects, our study is looking into the pure indirect network externalities from game developers to gamers. This is the biggest contribution of our paper. The multi-homing results are not conforming to other IS studies because it depends on the maturity of the platform.

Our study also has practical implications for online game firms. In June 2012, NCSOFT, one of the biggest online game developers, was merged by Nexon, the number one online game portal. Although NCSOFT had very popular online game such as Lineage series and AION, its online game portal www.plaync.com was not so successful due to the lack of variety of games. On the other hand, Nexon became the biggest online game portal by providing various and powerful genre games through publishing contacts with many developers. Therefore, the merger brings more customer bases for NCSOFT as well as more complement games for Nexon.

The limitations of this study are as follows: Firstly, our dependent variable was the unique number of visitors (UV). This variable may not fully reflect the true market share of online game markets because it was not possible to measure how long users play games and how much they pay. Secondly, we were able to study the uni-direction of the two-sided market. In other words, what we investigated in this paper was the impact of the relationship between developers and platform on end users (gamers). The other direction, the impact of the relationship between gamers and platform on developers was not meaningfully investigated due to the data problem of developer side. In fact, we tried the regression using the number of developers as a dependent variable and the market share of platform as an independent variable. The result of the regression turned out to be not significant. However, we don't believe this is the evidence that there is no network effect in this direction. Game developers in Korea, especially small sized developers, cannot

freely choose the platforms because platforms want to control the total number. Overcoming this problem and finding the true result in this direction remains for the future studies.

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ENDNOTES

1. According to "2011 China online game industry white paper" (Ministry of Culture of the People's Republic of China, 2012), the china's online game size in 2012 was about 7.5 billion U$, which increased 34.4% from the previous year. The number of china's online game user was 160 million, which also increased 33% from 2011. The china's online game industry is expected to record 16.3 billion U$ in 2016(International Data Corp, 2012).
2. First-person shooter (FPS) is a video game genre centered on gun and projectile weapon-based combat through a first-person perspective; that is, the player experiences the action through the eyes of the protagonist.
3. Massively multiplayer online role-playing game (MMORPG) is a genre of role-playing video games in which a very large number of players interact with one another within a virtual game world.
4. Real-time strategy (RTS) is a sub-genre of strategy video game which does not progress incrementally in turns.
5. Even with 'market share t-1', however, there turned out to be no qualitative differences in our main results.
6. Etnews.com. (2012), http://www.etnews.com/news/contents/game/2562342_1489.html
7. The usage of lagged variables is also the basic idea of Granger Causality Test.