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Business Group, Captive Market and Innovations

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Abstract

The transactions between affiliated firms of the business group have been massive on a regular basis in some industries and tunneling via these transactions has become an important campaign issue in the 2012 Presidential election of Korea. Besides the agency problem between controlling shareholders and minority shareholders, in the paper, we are concerned of the possibility that huge captive markets formed by inter-affiliate transactions might be related to low productivity growth. We provide a theoretical reasoning for this concern and an empirical example to support this theoretical reasoning.

Keywords: *business group, tunneling, captive market, innovations, efficiency, Chaebol.*

1. Introduction

The captive market has been studied at least two fields of economics such as Industrial Organization and Development Economics. In the literature of Industrial Organization, the formation of captive market between *independent* firms has been analyzed in the context of exclusive dealing and vertical integration, and the focus of these analyses has lied on the strategic aspect of its formation and its subsequent anticompetitive effects (see Ordover, Saloner, and Salop, 1990). On the other hand, the literature of Development Economics assumes the existence of captive market and then analyzes the equilibria of the contested market in the context of backward agriculture (See Basu and Bell, 1991; Mishra, 1994). In backward agriculture, the existence of captive market is typically justified by the landlord-creditor relationship of the rural credit market (see Bardhan, 1984).

In the paper, we raise an issue of innovations and captive market in the business group. As in the literature of Development Economics, the existence of captive market is assumed in our analysis. However, the justification of its existence comes from the transactions between affiliated firms of the business group which are motivated by *tunneling*. Moreover, our main concern of the existence of captive market is about its effects on the efficiencies of surviving firms and the industry evolution.

As shown in La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999), business group is a common form of ownership structure around the world except the USA and the UK, and the agency problem is more evident between controlling shareholders and minority shareholders in such an ownership structure. Much attention has been paid to possible expropriation, called tunneling, of minority shareholders by controlling shareholders through transactions from firms in which controlling shareholders have low cash-flow rights to firms in which they have high cash-flow rights. As the term of tunneling implies, usually it is not easy to prove its occurrence directly, and thus most of the academic research has attempted to measure it indirectly (see, for example, Bertrand, Mehta, and Mullainathan, 2002; Bae, Kang, and Kim, 2002; Cheung, Rau, and Stouraitis, 2006).

In contrast to the elusive nature of tunneling in other countries, the transactions between affiliated firms of the business group have been massive on a regular basis and tunneling via these transactions has been obvious in Korea[1]. The Korean business group, called Chaebol, has three distinctive features[2]. First, the concentration of economic power by top Chaebols

[1] Hence, the inter-affiliate transactions became an important campaign issue of the Presidential election in 2012 in Korea.

[2] Strictly speaking, Chaebol is a large business group whose total assets is more than 5 billion USD (assuming 1 USD = 1,000 KRW). However, some large business groups in Korea are not called Chaebol if they have no controlling family. According to the 2013 White Book of the Korea Fair Trade

has been substantial and rapidly increasing. The total sales of the top 10 Chaebols were equivalent to the 50.6% of GDP in 2003, and the number rose to 84.1% in 2012. In terms of total assets, the equivalent number was 48.4% in 2003 but jumped into 84% in 2012. Second, Chaebol is controlled by one single family which typically has less than 5% of the total shares of the entire Chaebol firms[3]. Lastly, the ownership structure of Chaebol is very complicated and its substantial changes have been accompanied by a generational succession within the controlling family[4].

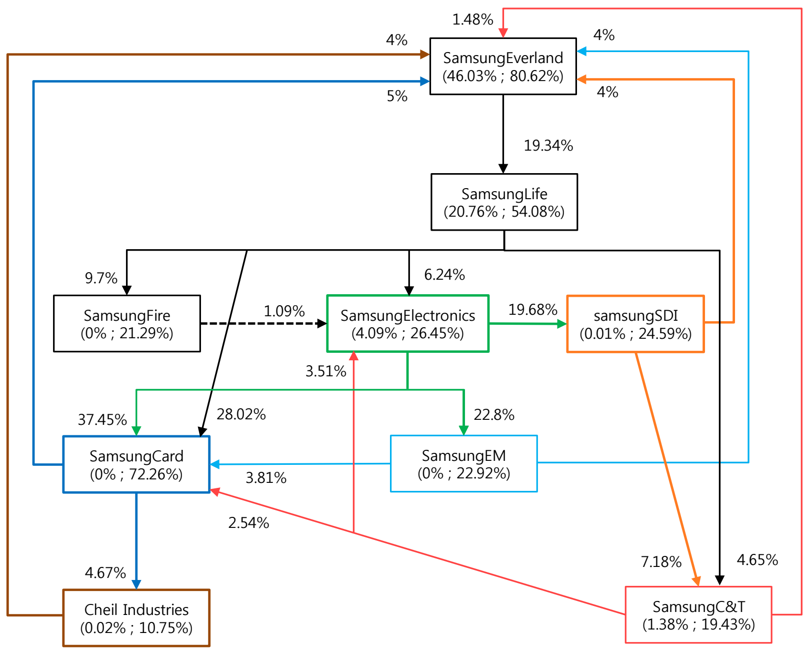
The most Chaebols in Korea have one of the two typical ownership structures. The first typical structure is called the *circular shareholding system* in which key affiliates are connected by indirect cross-shareholdings and the other affiliates are controlled by these key affiliates. The Samsung Group, the largest Chaebol in Korea, and the Hyundai Motors Group, the second largest Chaebol, have the circular shareholding system. For instance, as shown in figure 1, the Samsung Group has 9 key affiliated firms which are on the loop of the major indirect cross-shareholdings. The other 72 affiliates are controlled by these key firms. The other typical ownership structure is called the *holding company system*. The SK Group, the third largest Chaebol, and the LG Group, the fourth largest Chaebol, have the holding company system. However, the holding company system in Korea is not a typical holding company system. For instance, as shown in figure 2, the actual holding company in the SK Group is SKC&C which is not a part of the holding company system but controls the virtual holding company, SK Inc.

Commission, there are 63 large business groups in 2012, 43 of which have controlling families.

[3] According to the 2013 White Book of the Korea Fair Trade Commission, the controlling family of Chaebol has on average a 4.17% share of the Chaebol firms.

[4] Refer to Park (2012) for the changes in ownership structure and a generational succession within the controlling family.

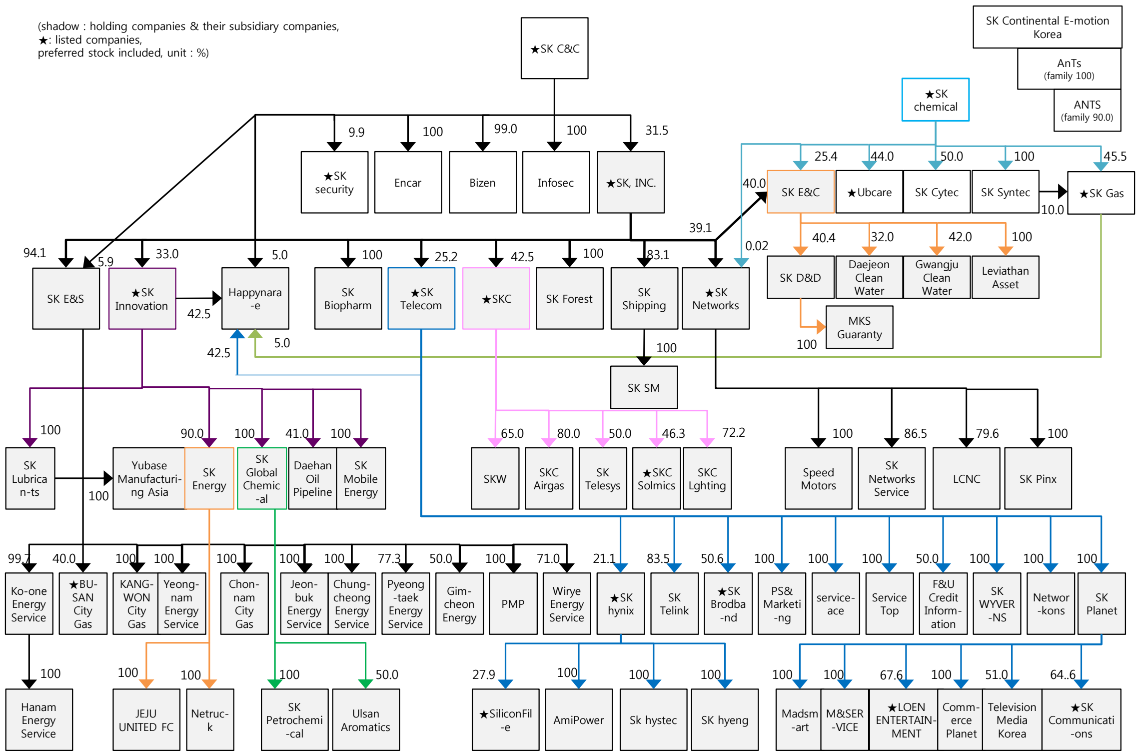
Figure 1: Circular shareholding of the Samsung Group in 2003



* (a%, b%) in the box indicates that the controlling family has a% share while together with the affiliated firms' shares it control b% share.

** c% on the arrow means that the arrow-originating firm has c% share of the arrow-destination firm.

Figure 2: Holding Company System of the SK Group in 2003



The inter-affiliate transactions in Chaebol are massive and the captive markets in certain industries are substantial in Korea. According to the Korea Fair Trade Commission, these inter-affiliate transactions occupied 12.04% to 13.20% of the Chaebols' total sales in the time period of year 2009 to year 2012. The share of inter-affiliate transactions has been especially high for the unlisted affiliated firms, whose inter-affiliate transactions accounted for 22.23% to 24.52% of their sales in the same time period. Furthermore, unlisted affiliates are typically the upstream firms which sell to the downstream listed affiliates, and the controlling shareholders' cash-flow rights are much higher in the unlisted affiliates. The Korea Fair Trade Commission showed that for some Chaebol firms in some business sectors, the inter-affiliate transactions account for 35% to 61% of total sales while the controlling family's share is between 41% and 54% (Refer to Table 1).

Table 1: Examples of controlling family's shares and inter-affiliate transactions ratios

Business sector	Number of Chaebol firms in concern	Inter-affiliate transactions ratio	Controlling family's share
warehouse and transportation service	2	35.09%	44.3%
computer programing and system integration/management	14	61.40%	54.3%
large construction	6	58.89%	41.4%
sports and entertainments	3	46.50%	48.1%
specialized service including advertisements	6	45.44%	32.6%

Source: Korea Fair Trade Commission

Besides the substantial tunneling issue from these tremendous captive markets,[5] in the paper we pay attention to the possibility that the huge captive markets in some business

[5] Based on the report of the Board of Audit and Inspection of Korea, it is estimated that over the last ten years, the capital gains from the inter-affiliate transactions amounted to about 2 billion USD for the chairman of the SK Group and the chairman and his son of the Hyundai Motors Group respectively.

sectors might be related to a low productivity growth. Indeed, many Korean newspapers have recently reported low productivity in the intermediate product industries, a great portion of which are supplied by affiliated firms in the captive markets. We provide a theoretical reasoning for this concern and an empirical example to support this theoretical reasoning.

The paper is organized as follows. Section II will develop a simple theoretical model to explain the effects of the captive market on the efficiency and the industry evolution. Section III will discuss the empirical example in which one industry is dominated by captive markets while the other is virtually free of captive market. We will see that the theoretical predictions made in section II square well with the facts in this example. Section IV will conclude.

2. The Model

We extend the model in Mishra (1994) to introduce *asymmetry in marginal costs*. As in Mishra (1994), we assume that there n identical consumers in the market, each with a linear inverse demand function given by

$$p = p(q) = a - bq.$$

where p is the price and q is the quantity demanded for the homogenous products.

We also assume that only firm 1 has a captive market and the size of captive market is n_1 ($< n$). In other words, we posit a situation in which firm 1 is an affiliated firm of business group and thus sell to the downstream affiliated firms exclusively while firm 2 is an independent firm. Thus firm 1 and firm 2 compete only in the contested market. As in Mishra (1994), we further assume that a firm cannot discriminate between captive and contested market in the price.[6]

Then firm 1's profit is given by

$$\Pi_1 = [p(\frac{Q_1 + Q_2}{n \quad n_1}) \quad c_1][Q_1 + \frac{n_1}{n \quad n_1}(Q_1 + Q_2)],$$

where c_i is firm i's constant marginal cost (with $c_i < a$) and Q_i is firm i's output level in the contest market[7]. On the other hand, firm 2's profit is given by

$$\Pi_2 = [p(\frac{Q_1 + Q_2}{n \quad n_1}) \quad c_2]Q_2 .$$

We assume that firm 1 and firm 2 compete in the contested market and the solution concept of this game is a Cournot-Nash equilibrium. Then in equilibrium firm 1's and firm 2's profits are obtained as follows.

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[6] The Fair Trade Act of Korea regulates the price in the captive market to be equal to the price in the contested market within some margin of error.

[7] We ignore the integer problem.

(1) $$\Pi_1^* = \frac{n(na - (2n - n_1)c_1 + (n - n_1)c_2)^2}{(3n - n_1)^2 b}, \quad \text{and}$$

(2) $$\Pi_2^* = \frac{n^2(n - n_1)(a + c_1 - 2c_2)^2}{(3n - n_1)^2 b}.$$

From these two equations, it can be shown

(3) $\Pi_1^* \geq 0$ if and only if $na - (2n - n_1)c_1 + (n - n_1)c_2 \geq 0$, and

(4) $\Pi_2^* \geq 0$ if and only if $a + c_1 - 2c_2 \geq 0$.

Now we suppose that neither firm 1 nor firm 2 has the captive market. Without captive market, firm 1's and firm 2's profits in equilibrium can be obtained as follows.

(5) $$\Pi_1^e = \frac{n(a - 2c_1 + c_2)^2}{3^2 b}, \quad \text{and}$$

(6) $$\Pi_2^e = \frac{n(a + c_1 - 2c_2)^2}{3^2 b}.$$

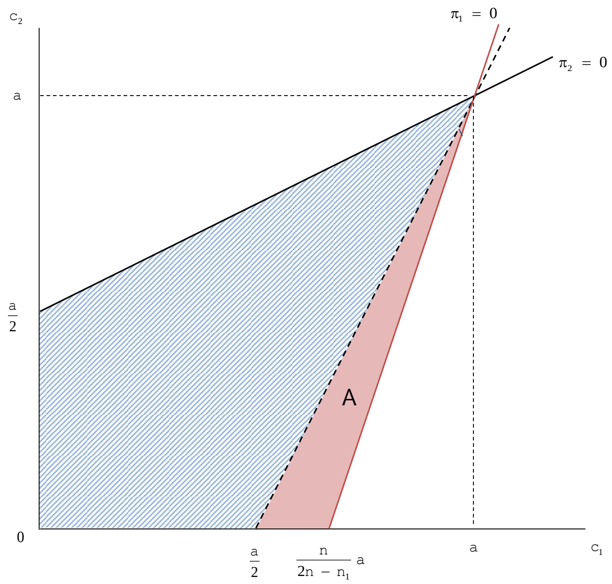
From these two equations, it can be shown

(7) $\Pi_1^e \geq 0$ if and only if $a - 2c_1 + c_2 \geq 0$, and

(8) $\Pi_2^e \geq 0$ if and only if $a + c_1 - 2c_2 \geq 0$.

Figure 3 illustrates that (c_1, c_2) values which satisfy conditions in (3) and (4) at the same time have a larger area than (c_1, c_2) values which satisfy conditions in (7) and (8) simultaneously. More specifically, the shadowed area marked by A in figure 3 indicates (c_1, c_2) values with which firm 1 cannot survive without its captive market. Hence, we can infer that the existence of captive market increase its survival likelihood if the efficiency levels (c_1, c_2) occur randomly. Moreover, it is straightforward from figure 3 that the shadowed area marked by A gets larger if the size of the captive market (n_1) increases. In other words, a firm with a bigger captive market can survive with lower efficiency.

Figure 3: Survival rate of a firm with the captive market



Based on this finding, we proceed to propose some hypotheses for empirical testing. The finding in figure 3 implies that in comparison with an industry with no captive market, we can expect *a lower average productivity in an industry in which some firms have captive markets while the others do not* if neither of these two industries is a monopoly.

Furthermore, the firm without captive market has a lower incentive for innovations. The comparison of firm 2's profit in (2) and (6) indicates that the firm without captive market has lower profits if the other firm has a captive market for the same levels of efficiencies (c_1, c_2). Hence, if R&D investments are strategic complements, firm 1 and firm 2 will invest less for innovations in the industry in which some firms have captive markets while the others do not. If it is the case, we expect *a lower likelihood of occurrence of innovations in this industry*.

For empirical testing of these two hypotheses, we adapt two types of indexes from Melitz (2003) and Chun et al. (2008). Melitz (2003) showed that only if the average efficiency of an industry is above the threshold level, the industry can participate in trade and more efficient firms export more. The Melitz model and our model are different in several aspects. The Melitz model is a general equilibrium model of the monopolistic competition while our model is a partial equilibrium model with strategic interactions. More fundamentally, the asymmetry caused by the existence of captive market cannot be incorporated into the Melitz model. Despite these differences, we believe that the average efficiency of an industry or the efficiency of a firm is related to the exports-to-sales ratio. Indeed our conjecture is consistent with not only the Melitz model but also the empirical facts that more productive firms self-select into export markets (see, for example, Bernard and Jensen, 1999; Aw, Chung, and Roberts, 2000; and Clerides, Lack, and Tybout, 1998). Hence in the paper we use the *exports-to-sales ratio* as a proxy for efficiency.

In addition, we use *firm-specific performance heterogeneity* as a metric of the occurrence

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of innovations. As argued in Chun et al. (2008), firm-specific performance heterogeneity may be a finer metric of the intensity of occurrence of innovations. In the paper, firm-specific performance heterogeneity will be measured by sales growth and ROAs (or ROEs). The specifics of these indexes will be discussed in the following section.

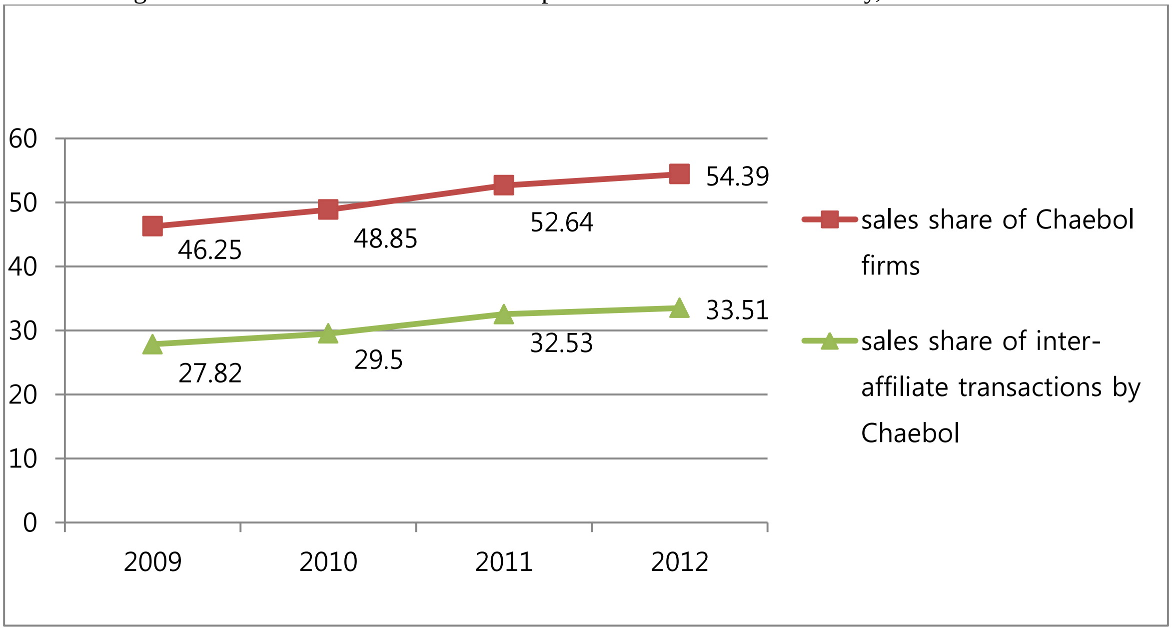
3. An Empirical Example

A prominent example of huge captive markets formed by inter-affiliate transactions of Chaebols is the SI (system integration/management) sector in Korea (See Table 1). The SI is usually defined as the process of bringing together the component subsystems, such as computer networking, enterprise application integration, business process management or manual programming, into one system and ensuring that the subsystems function together as a system. In the paper, based on the five-digit Korea Standard Industrial Classification ("KSIC-9") code, we specifically define the SI industry to include "system software development and supply" (KSIC-9 code # 58221), "applications system software development and supply" (KSIC-9 code # 58222), "computer programming service" (KSIC-9 code # 62010), "computer system integration consulting and supply" (KSIC-9 code # 62021), "computer facility management" (KSIC-9 code # 62022), "IT and computer operation related service" (KSIC-9 code # 62090), "data processing" (KSIC-9 code # 63111), and "hosting and related service" (KSIC-9 code # 63112).

The captive market occupies a huge portion of the SI industry in Korea. According to the public notices of the listed and the outside-audit-required firms posted on the DART system (Data Analysis, Retrieval and Transfer System), the inter-affiliate transactions of Chaebols accounted for 31% of the industry total sales during the time period of 2009 to 2012. The top three firms, such as Samsung SDS, LGC&S, and SKC&C, occupies 29% of the SI industry with the inter-affiliate transactions accounting for 56% to 60% of their sales.[8]

[8] The other Chaebol firms' shares of the captive market in their sales are also above 50%.

Figure 4: Share of Chaebols and their captive markets in the SI industry, 2009-2012



The game software industry has sharp contrasts against the SI industry. The game software industry also belongs to "software development and service" sector in the three-digit KSIC-9 code, which include not only "system software development and supply" (KSIC-9 code # 58221) and "applications system software development and supply" (KSIC-9 code # 58222) but also "online mobile game software development and supply" (KSIC-9 code # 58211) and "other game software development and supply" (KSIC-9 code # 58219). The former two belong to the SI industry while the latter two consist of the game software industry. Hence, the game software industry has similar characteristics with the SI (at least some of the SI) industry. However, the game software industry has virtually no captive market since the consumer of the game software industry is individual citizens while the consumer of the SI industry is firms.

Before we proceed to apply the two hypotheses we discussed in section 2 to the SI and the game software industries, we provide some comparison of these two industries in terms of corporate demography, competitive pressure, research and development, and corporate finance. Table 2 shows the average values of the related variables during the time period of 2001 to 2012.

Table 2: Comparison of the SI and the game software industries (2001-2012)

	corporate demography			**competitive pressure**	**research and development**	**corporate finance**	
	average number of firms	**average age**	**average ln(sales)**	**Herfindahl-Herschman Index**	**average R&D spending divided by PP&E[a]**	**leverage[b]**	**liquidity[c]**
SI	520	8.94	22.9	358	4.15	0.6	10.97
Game software	69	6.79	21.2	932	1.45	0.63	18.85

a: Only 52.9% of the SI firms and 46.1% of game software firms have reported R&D spending.

b: leverage = total debt / total assets.

c: liquidity = current assets / current liabilities.

The SI industry is much larger than game industry. As shown in table 2, sales per firm are almost the same between these two industries. However, the SI industry has almost 7.5 times as many firms as the game software industry. Hence the size of the SI industry is much bigger in terms of sales. Consequently, the concentration of the industry, measured by Herfindahl-Herschman Index (HHI), is much higher in the game software industry. The firms in the SI industry are on average more than two years older and spent more R&D expenditures adjusted by PP&Es. However, in the corporate finance aspects, the game software firms were equipped with better liquidity and almost the same leverage.

We now proceed to apply the two hypotheses we discussed in section 2. From our simple theory model, we conclude that *the average productivity is lower in an industry with larger captive markets*. Furthermore, if R&D investments are strategic complements, *the occurrence of innovations is less likely in this industry*. Motivated by theoretical results in Melitz (2003) and the related empirical findings in Bernard and Jensen (1999), Aw, Chung, and Roberts (2000), and Clerides, Lack, and Tybout (1998), we will use the exports-to-sales ratio as an indicator to the productivity. Hence our first hypothesis is rephrased as follows.

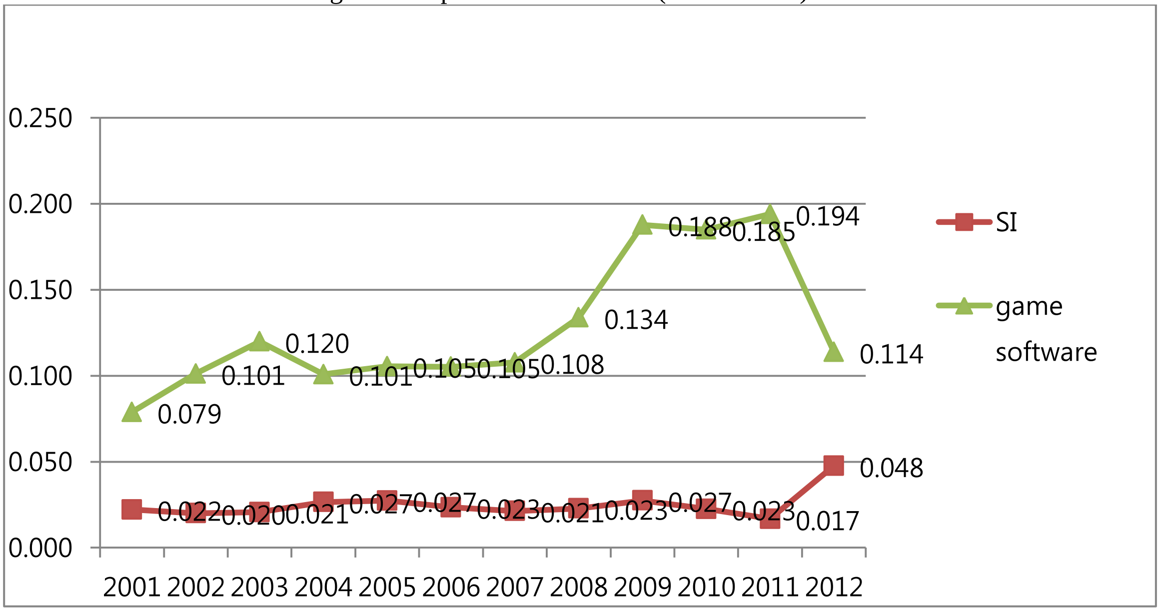
Hypothesis 1: The SI industry has a lower exports-to-sales ratio than the game software industry.

Furthermore, as argued in Chun et al. (2008), we use *firm-specific performance heterogeneity* as a metric of the occurrence of innovations. Following Durnev, Morck, and Yeung (2004), Chun et al. (2008) distinguished firm-specific variation from the sum of market- and industry-related variations in real sales growth and stock returns. In the paper, we follow the same steps in Chun et al. (2008), but in addition to real sales growth we use ROAs (or ROEs) instead of stock returns to obtain the indexes for firm-specific performance heterogeneity. The reason that we use ROAs (or ROEs) instead of stock returns is that most of the SI firms are not listed in the stock market. Actually the top SI firms are much bigger than the top game software firms, many of which are listed. This twist is believed to be related to tunneling in the captive market of the SI industry. Hence the second hypothesis is rephrased as follows.

Hypothesis 2: The SI industry has lower firm-specific performance heterogeneity.

For the first hypothesis, we can obtain export (Kisvalue # 121195) and total sales revenue (Kisvalue # 121190) data from the income statement posted on the DART system. In the case that we cannot find export amounts in the income statement, we check the annual report and the financial statements. If we cannot find any information in this process, we record the firm's export equal to zero. In the end, we have 911 non-zero firm-year observations out of the 6243 observations in the case of the SI industry and 229 observations out of 831 in the case of the game software industry. In other words, in our data, 14.6% of SI firms and 27.6% game software firms participated in exports in 2001 – 2012. Consistently, the SI industry has a lower exports-to-sales ratio than the game software industry during the time period (See figure 5). The average exports-to-sales ratio of the SI industry was at most 4.8% while the average rose from 7.9% to 19.4% in the game software industry.

Figure 5: Exports-to-sales ratios (2001 – 2012)



* Exports data are obtained from KISVALUE.

Before we conclude, we are concerned of two possibilities. First, since our exports data may have the missing data problem which could be biased against the SI industry, we have checked the top three firms' ratios which are calculated from another data available from the financial statements in 2012. The ratio of the top SI firms was only 9.79%, 9.92%, and 3.11%, respectively. In contrast, the largest game software firm which was a foreign firm (Nexon

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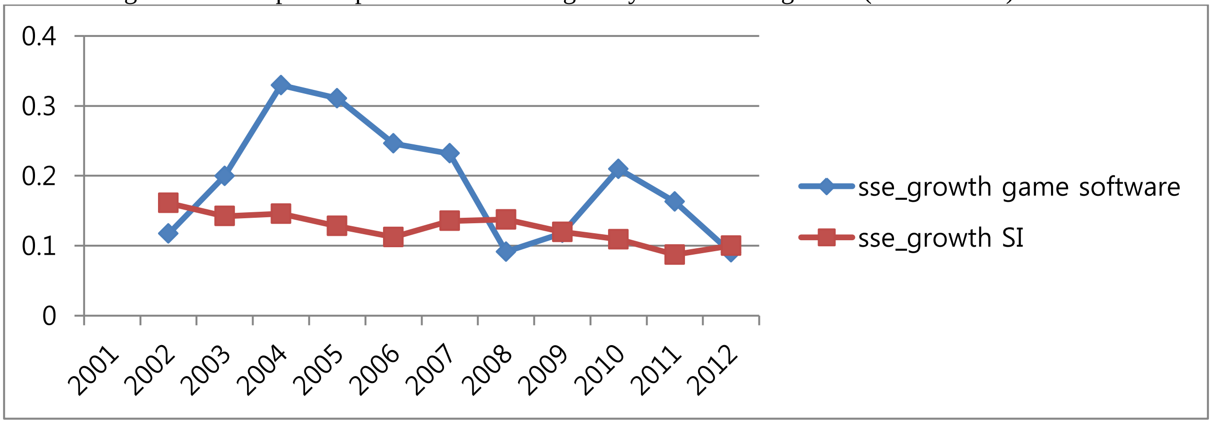
Korea) has no exports[9], but the second and the third largest firms had the values of 55.5% and 15.79%, respectively. Second, we may be concerned of difference in trade barriers between these two industries. However, the some SI and the game software firms belong to the same three-digit KSIC-9 classifications, and smaller firms also participate in exports actively in both industries. Even if the SI industry may incur higher export-related sunk costs, we do not believe that the differential in the exports-to-sales ratios in figure 5 can be justified. Therefore, we infer that the hypothesis 1 is supported by empirical facts.

For the second hypothesis, we construct indexes for firm-specific performance heterogeneity as follows. Regressing the firm's annual real sales growth onto the sales-weighted market and industry averages, we obtain firm-specific residuals. In the regression, 'the market' is defined by the SI or the game software industry while 'the industry' is understood as the KSIC-9 five digit sub-industries. Then using the firm-specific residuals, we obtain the sum of squared residuals (SSE) divided by the number of firms in a year, which represents the *mean firm-specific variation* each year. For ROAs and ROEs, we apply the same procedure. These mean firm-specific variations are the indexes for firm-specific performance heterogeneity in our case. Figures 6 to 8 show these three indexes from annual real sales growth, ROAs and ROEs.

Figure 6. Firm-specific performance heterogeneity in real sales growth (2001 – 2012)



[9] Despite the fact that the SI industry is open to the foreigners like other IT industries, the industry is dominated by domestic firms. The only visible foreign firm is IBM Korea which is the fourth largest SI firm with only a 4.3% of the market share.

Figure 7: Firm-specific performance heterogeneity in ROA (2001 – 2012)

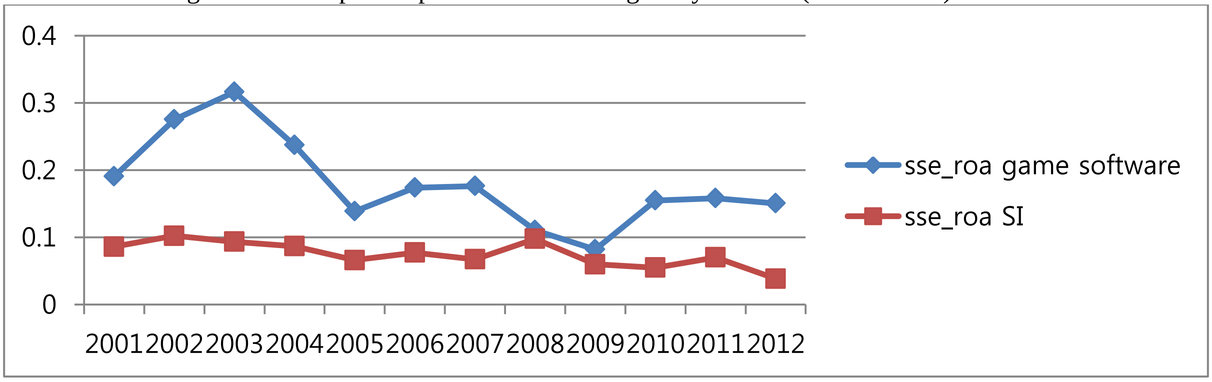
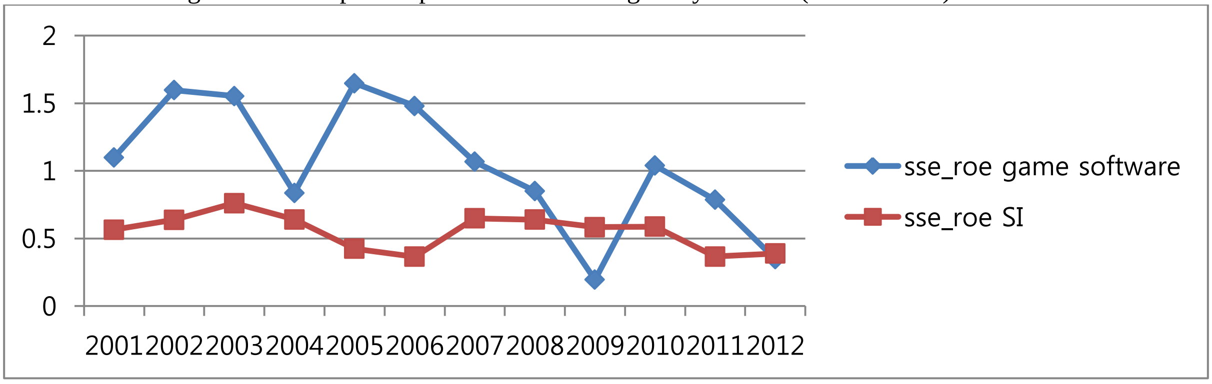


Figure 8: Firm-specific performance heterogeneity in ROE (2001 – 2012)



As shown in figure 6, the game software industry has experienced more firm-specific performance heterogeneity on average except 2002, 2008, 2009 and 2012. In 2009 and 2012, the index has virtually the same value across these two industries. It is puzzling that the index has a lower value in the game software in 2002, but our conjecture is that the industry was in the early stage in early 2000s and has grown fast until the global economics crisis in 2008. The game software industry must be hit harder by this global economic crisis. The indexes based on ROAs and ROEs in figures 7 and 8 show us basically the same pattern except 2002 and the lagged impacts of the global economics crisis in 2009.

In the above comparison, we did not control the differences between these two industries which may affect the firm-specific performance heterogeneity. As these differences, Chun et al. (2008) considered corporate demography, competitive pressure, research and development, and corporate finance shown in table 2. The regression results in table 3 of Chun et al. (2008) indicates that average firm age, average size, HHI, leverage have significant and negative coefficients, but R&D spending has a significant and positive coefficient in the case of sales growth. As shown in our table 2, the game software industry is younger on average, more concentrated but spent less R&D expenditures while it has similar average size and leverage on average. Hence differences in these control variables may have canceling-off effects on the firm-specific performance heterogeneity, and if there is any bias, the firm-specific performance heterogeneity of the game software industry might be under-evaluated in figure 6. Therefore, we infer that the hypothesis 2 is supported by empirical facts.

4. Conclusion

Recently tunneling through inter-affiliate transactions of business group has been a hot political issue in Korea. Besides the agency problem between controlling shareholders and minority shareholders, in the paper, we found that huge captive markets formed by inter-affiliate transactions might be related to low productivity growth. Extending the model in Mishra (1994) to introduce asymmetry in marginal costs, we showed that the firm with a captive market is more likely to survive even with a lower efficiency. Based on this theoretical finding, we inferred that the average productivity is lower in an industry with larger captive markets and if R&D investments are strategic complements, the occurrence of innovations is less likely in this industry.

For an empirical testing of these hypotheses, we choose two industries, the SI industry and the game software industry. The SI industry is a most-frequently-mentioned example of huge captive markets formed by inter-affiliate transactions of Chaebols in Korea. On the other hand, the game software industry has virtually no captive market since its consumer is individual citizens. In this empirical comparison, we used the exports-to-sales ratio as an indicator to the average productivity of an industry, and found that the SI industry has lower exports-to-sales ratios than the game software industry. We also used firm-specific performance heterogeneity as a metric of the occurrence of innovations. Adapting the indexes for mean firm-specific variations in Chun et al. (2008) to our case, we found that overall the SI industry has lower mean firm-specific variations in real sales growth, ROA and ROE. Based on these empirical findings, we concluded that our theoretical reasoning is supported by the empirical facts.

Our conclusion is, however, not based on a statistical testing using a large number of observations, and thus more quantitative studies are invited to statistically test our claim. At the same time, our theoretical reasoning is based on a simple linear Cournot model. Incorporation of the asymmetry caused by the captive market should be a challenge to extend this simple model to a more general setting including price competition with differentiated products and general equilibrium analysis.

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