Dynamic Performance and Structural Changes of Korean Firms after the Financial Crisis: Evidence from Survey of Business Structure and Activities (2005-2007)

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Abstract

This paper introduces *Survey of Business Structure and Activities* conducted by National Statistical Office in Korea during the period of 2005-2007 and analyzes Korean firms' activities after the financial crisis of 1998-1998. Korean firms are found to have increased their R&D and managerial innovation from e-business. The higher the transparency of technologies of the industry to which the firm belongs is, the higher the effect of a firm's catch-up with advanced firms. Korean firms have also increased their global net working and outsourcing activities. There was also a positive correlation between R&D intensity and size of firms. These findings are in accord with the Japanese firms' recent activities observed in Japan's Basic Survey of Business Structure and Activities.

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1. Introduction

In the market economy system, firms are the most important economic agents taking charge of production activities which are the ultimate sources of returns to capital and labor income. Since the growth and the development of firms are directly linked with national well-being, firms' performance reflects the nation's economic progress in living standard. Therefore, the need for firm-specific database has been emphasized in recent years and national statistical offices have paid due attention to enhance firm-specific data in addition to conventional establishment-based survey data.

There have been two approaches for researches on firms' activities. First is the industry-level approach. An industry can be defined as the aggregation of firms performing similar business activities, and therefore, the industry-level approach is to analyze firms' activities by using aggregated data on an industry, not on each firm. Until 1970s and 1980s, most studies on firms' activities were based on the industry-level approach. More recent studies by Pyo, Rhee and Ha (2007)(2008) and Chun, Pyo and Rhee(2008) have adopted this approach. However, under the traditional static theory of firms, it was difficult to explain why there exist successful firms and unsuccessful firms under the same regulatory conditions and surrounding factors. Second is the firm-level approach, which analyzes patterns and characteristics of firms' activities and estimate firms' achievements based on information from each firm, not from the aggregated data. Recent studies in Korea include Hahn (2000)(2004), Ahn, Fukao and Kwon (2004), Ahn (2005) and Rhee and Pyo (2008).

The firm-level approach has gradually gained popularity since 1990s. For example, in case of Korea, we had to pay deep attention to why there were significant differences in performance among different firms within the same industry during the financial crisis. The industry-level analysis could not reveal factors behind the firms' up-and-down phenomenon and therefore called for re-orientation of the research on firms toward the increasing use of micro-based firm-specific data. The popularity of this emerging research can also be due to the increased availability of micro-level data and to the dissatisfaction with the concept of aggregate production function. The most important motivation, however, has been the emergence of interesting questions that can be addressed effectively only with the use of micro data given

the severe heterogeneity of firms' characteristics, such as size and performance. The other obvious reason for the usefulness of the large samples of the micro-level panel data is that it allows us to control a number of factors to obtain more robust parameter estimates.

On the other hand, we also have to pay due attention to the limitation of firm-level data when we want to expand firm-based findings to the industry-level and national level because firm-specific micro data are usually limited in sample size and therefore, tend to be sensitive to the way samples are stratified and surveys are conducted. In other words, it will be appropriate to examine the firm-level data and findings and compare those with empirical results at industry-level and national level. At the same time, many sources of micro data are private and commercially funded. For example, Korea Investors Service Co. (KIS) or National Information and Credit Evaluation Co. (NICE) provide listed firms' firm-specific financial information but they may lack non-financial information and do not provide unlisted and unincorporated firms.

With these developments in mind, *Survey of Business Structure and Activities* was conducted by National Statistical Office of Korea during the period of 2005-2007. While the Mining and Manufacturing Census and Survey are establishment-based and production-oriented, *Survey of Business Structure and Activities* was conducted to make full-scale firm statistics including wide spectrum of business activities such as business structure, R&D, external service, networking between firms, business strategy, the use of information technology, and the use of management information system. In what follows, the outline of the survey will be presented in section 2. Section 3 summarizes major findings of the survey and analyses on determinants of business activities. Section 4 concludes the paper.

2. Outline of *Survey of Business Structure and Activities* (2005-2007)

The purpose of conducting a *Survey of business structure and activities*[1] is to provide basic data for the policy authorities by examining the actual conditions of firms' business environments, management strategies such as diversification, globalization, and strategic

[1] Report by Lee and Pyo(2009).

alliances and the changes in their industrial structure through a comprehensive survey of firms' diverse economic activities. The first survey was conducted in 2006 and has been conducted every year since 2006. So far the database for three consecutive years (2005-2007) has been built.

The scope of the survey in terms of industry classification covers the entire industries including Agriculture & Forestry, Mining & Manufacturing and Services as shown in Table 1. The survey was conducted to about 12,000 firms with more than 50 employees and capital above 300 million Won (in case of Retail & Wholesale and other Services, the firms with less than 50 employees but with capital above 100 million Won) as of December 31 every year. These firms' sales amount covers about 70 percent of total sales so that the sample seems to represent well the population of entire firms.

Table 1 Number of Firms in *Survey of Business Structure and Activities* (2005)

(unit: numbers, %)

Industrial Classification	Surveyed Firms (A)	Incorporated Firms (B)	(A)/(B)
Agriculture, forestry, and fishing	25	474	5.3
Mining and quarrying, and manufacturing	6,408	53,131	12.1
Electricity, gas, steam and water supply	48	108	44.4
Construction	675	36,849	1.8
Wholesale and Retail trade	886	45,341	2.0
Accommodation and food service activities	182	1,429	12.7
Transportation	743	13,603	5.5
Information and communications	56	715	7.8
Financial and insurance activities	233	2,158	10.8
Real estate activities and renting and leasing	161	5,680	2.8
Services	1,829	28,078	6.5
Total	9,147	187,566	4.9

Source: Lee and Kim (2009)

Korea's *Survey of Business Structure and Activities* is quite similar to Japan's *Basic Survey of Business Structure and Activities* in terms of both the scope and the contents of survey except the way the survey was conducted: interview or mail survey as summarized in Table 2. France's survey seems to cover relatively more small firms including those with employees over 10.

Table 2 Comparison of *Survey of Business Structure and Activities* :Korea, Japan and France

	Korea	Japan	France
Surveyed name	*Survey of Business Structure and Activities*	*Basic Survey of Business Structure and Activities*	*Structural Enterprise Statistics*
Coverage	-Total industries -employees over 50 with capital over 300 million won	-except Financial and insurance activities, Transportation, Construction and other services -employees over 50 with capital over 30 million yen	-Total industries -sampling by domestic investment firms or foreign investment firms, and by employees over 10 and sales over 38 million euro or employees under 10 and sales under 38 million euro
Survey frequency	every year	every year	every year
First survey year	2006	1992	1996
Recent survey year	2008	2008	2008
Kinds of questionnaire	2 kinds(by industry)	1	2 kinds(by size of firms`)
Survey contents	-7 fields except organizations within the firm, and the number of employees	-11 fields except organizations within the firm, and the number of employees	-firms' transition -by organization, size, industry, and types of business -firms' innovation -firm's subsidiary system -firm's asset and business performance
Survey method	temporarily-hired survey conductors	mail survey	mail survey

Source: Lee and Kim (2009)

As shown in Table 3, the contents of the survey include a firm's general information (company name, location, representative director's name, year of establishment, form of establishment, and capital) and general information on the business management and strategies such as outsourcing, R & D, possession of technology, management information system, operations in overseas markets and strategic business alliances etc. The most noticeable characteristic of the survey on business structure and activities is that it includes information on the management indicators and strategies, which were not covered by the previous statistical surveys on the Mining & Manufacturing industry and the Service industries.

Table 3 Contents of Survey on Business Structure and Activities

a. General Information

- Company name, location, representative director's name, year of establishment, form of establishment, and capital (paid-in capital)

b. Organizations within the firm, and the number of employees

c. Assets and liabilities, and items related to capital

d. Business performances

e. Affiliated companies (subsidiaries, related companies, parent companies)

f. Transactions with other firms and overseas transactions (proportion of branches and subsidiaries)

g. Cost of outsourcing

h. Research and Development

i. Possession of technology and use

j. Management information system

k. Firm's management practices

- Franchise, operation in overseas markets, new-business launch, strategically allied companies
- Performance-based compensation system

Table 4 Comparison between *Survey of Business Structure and Activities* and KIP2008 Database

Year	Nominal Values	*Survey of Business Structure and Activities* (A) (Million won)	KIP2008 Database (B) (Million won)	(A)/(B) Ratio
2005	Net Value-added	240,882,685	699,409,600	0.34
	Gross Output	1,396,790,127	1,861,198,561	0.75
2006	Net Value-added	252,172,660	730,731,500	0.35
	Gross Output	1,490,000,000	1,972,167,346	0.76
2007	Net Value-added	295,474,883	778,873,900	0.38
	Gross Output	1,683,730,838	2,102,098,612	0.80

Note: In case of *Survey of Business Structure and Activities*; Gross Output=Total Sales; Net Value-added=Ordinary Income + Total Salary + Tax + Depreciation Costs + Rent + Bad debt expenses

Sources: Lee and Pyo (2009)

The 2006 *Survey on business structure and activities* was conducted to a total of 10,786 firms (affiliated with 68,202 firms). To check the degree of representation of this survey which includes the general information on the firms, the total value added and total amount of production for 2005-2007, we have compared the survey results with the figures in KIP2008 Database, which can be regarded as the industrial database. As shown in Table 4, the nominal net value-added amount and the nominal gross output in the 2005 *Survey of business structure and activities* accounted for 34% and 75% respectively of the KIP Database. The nominal net value-added as well as the nominal gross output accounted for 35% and 76% respectively in 2006 and 38% and 80% in 2007 respectively.

According to Sohn (2009), while the number of subsidiary enterprises of total firms surveyed is only 2.1% of the total number of enterprises, they account for 21.4% of the total number of employee in employment, and 38.8% of GDP in value-added. The number of firms has declined from 10,908 in 2005 to 10,749 in 2007 but the number of subsidiary enterprises increased by 9,422 from 60,317 in 2005 to 69,728 in 2007.

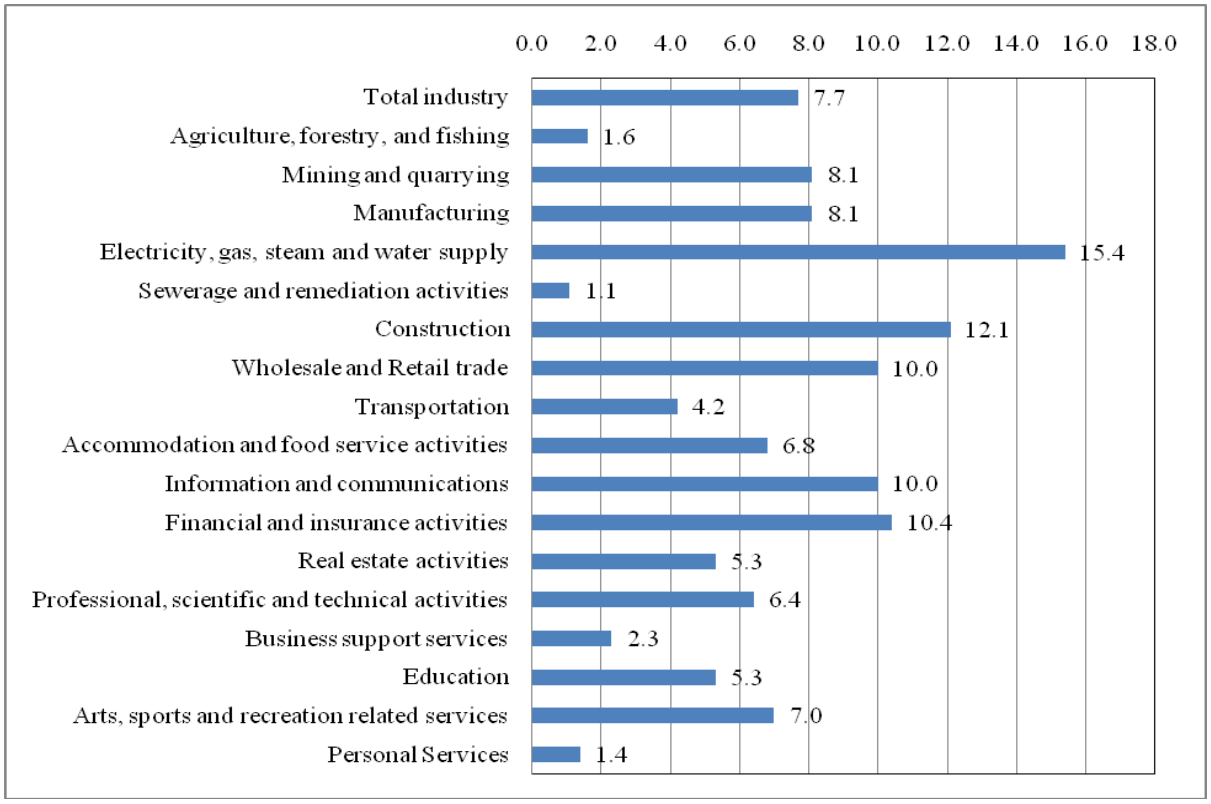
The firms' regional distribution shows 63.3% of the surveyed firms are centered in the metropolitan area and 84.7% of their subsidiary enterprises are also centered in the metropolitan area. The firms' concentration ratio in the metropolitan area has increased from 62.5% in 2005 to 63.3% in 2007 and their subsidiaries' concentration ratio also increased from 82.4% to 84.7% during the same period. In terms of business diversification, 31.4% of firms are engaged in other industrial activities except main business and the ratio of other business ratio has increased from 23.2% in 2005 to 31.4% in 2007. In terms of management performance, Finance and Insurance activities and Electricity, Gas, and Water Supply have recorded large profits. The trend of business profit indicates that profits of Professional, Scientific and Technical Activities have been largely expanded but on the other hand, Agriculture & Forestry, Business and Personal Services recorded lower profits.

Korean firms are found to have increased their operations abroad during the period of 2005-2007 significantly. While the total number of firms surveyed declined by 159 firms, the number of firms which have engaged in overseas operation has increased by 792 firms. Among them there were 414 Manufacturing firms, 74 Construction firms, 84 Retail &

Wholesale firms and 79 Printing and Visual Communication firms. As shown in Figure 1, the ratio of firms which have engaged in foreign business activities in total number of firms surveyed by industries indicates the largest in crease in Electricity and Gas (15.4 %) which is followed by Construction (12.1 %) and Finance and Insurance (10.4 %).

Figure 1 Increase in the Ratio of Business with Foreign Operations by Industry (2005-2007)

(unit: %point)



Source: Sohn (2009)

3. Major Findings from *Survey of Business Structure and Activities*

The major findings from *Survey of Business Structure and Activities* are summarized in this section and compared with recent findings from studies on Japanese firm activities.

3.1 Diversification and Internationalization

Park (2009) analyzed aspects of diversification and internationalization of Korean firms' activities and identified the decision factors of diversification and internationalization. In

addition, the correlation between the two indicators and its impact on business performance has been assessed. The result of analysis has found the following facts. First, the important decision factors of diversification and internationalization are firm's size and age. The larger the firm is, the deeper diversification and internationalization is, and the older the firm is, the higher possibility of the diversification. Second, the relative importance of import and export and the possession of subsidiaries in foreign countries have affected firms' diversification and internationalization. The firm which has higher degree of diversification tends to have higher weight of import and export and more subsidiaries in foreign countries in non-financial sector.

On the other hand, the result showed that there is no significant relationship in financial sector. Third, there is a significant relationship between diversification and the possession of subsidiary. The possession of domestic subsidiaries is in general connected to horizontal diversification while the possession of subsidiaries in foreign countries is connected to related diversification. Fourth, the effect of diversification and internationalization on the business achievement is in general positive effect in financial sector, but there is no significant finding in non-financial sector.

Table 5 Correlation between Diversification and Internationalization Indicators (Non-financial Sector)

	SR	BI	DT	DR	DU	Weight of export and import	Weight of foreign outsourcing	Weight of foreign capital	Weight of subsidiary in foreign country
SR	1								
BI	-0.99***	1							
DT	-0.97***	0.98***	1						
DR	-0.69***	0.69***	0.76***	1					
DU	-0.70***	0.73***	0.70***	0.16***	1				
Weight of export and import	-0.07***	0.07***	0.08***	0.06***	0.05***	1			
Weight of foreign outsourcing	0.01	0	0	-0.02	0.01	0.14***	1		
Weight of foreign capital	-0.01	0.01	0.01	0.01	0	0.22***	0.03***		
Weight of subsidiary in foreign country	-0.13***	0.14***	0.14***	0.07***	0.14***	0.30***	0.14***	-0.04***	1

Note: ***, **, and * mean each 1%, 5%, and 10% significance level. ; SR-Specialized Rate, BI-Berry Index, DT-total diversification index, DR-related diversification index, DU-unrelated diversification index
Source: Park (2009)

Table 6 Correlation between Diversification and Internationalization Indicators (Financial Sector)

	SR	BI	DT	DR	DU	Weight of foreign capital	Weight of the possession of subsidiary in foreign country
SR	1						
BI	-0.99***	1					
DT	-0.98***	0.99***	1				
DR	-0.96***	0.97***	0.99***	1			
DU	-0.31***	0.30***	0.27***	0.12*	1		
Weight of foreign capital	0.06	-0.05	-0.05	-0.04	-0.09	1	
Weight of the possession of subsidiary in foreign country	-0.02	0	0.01	-0.01	0.07	-0.14**	1

Note: ***, **, and * mean each 1%, 5%, and 10% significance level. ; SR-Specialized Rate, BI-Berry Index, DT-total diversification index, DR-related diversification index, DU-unrelated diversification index
Source: Park (2009)

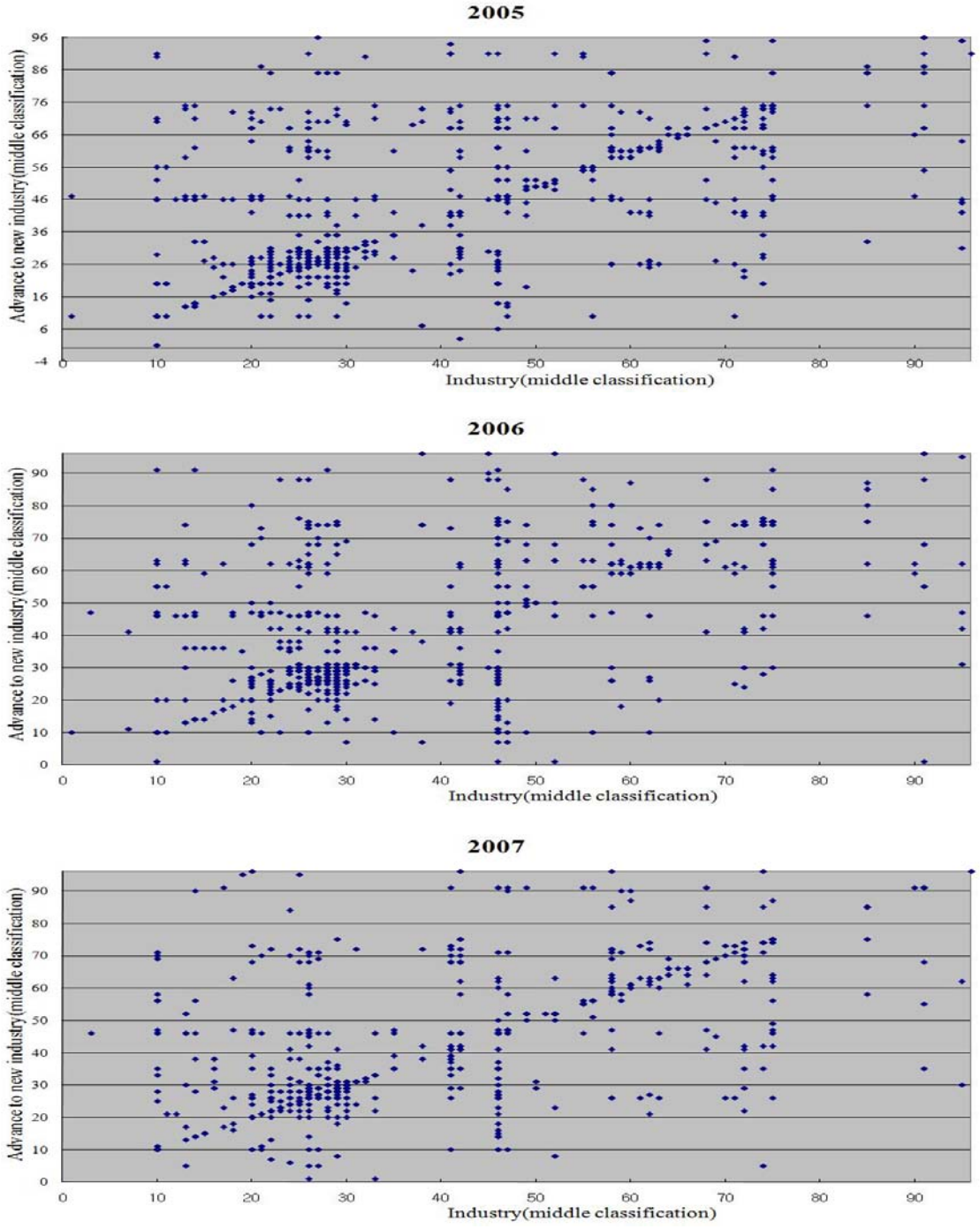
3.2 Outsourcing, Strategic Alliance, and R&D

Kim (2009) finds the importance of outsourcing and strategic alliance in Korean firms' recent business activities. However there have been few empirical studies on outsourcing and strategic alliance. What factors make firm carry in outsourcing or strategic alliance, and what outsourcing or strategic alliance affect on firm achievement is greatly important topic of research. The result of analysis is that there are totally different results by model's form in the case of the outsourcing decision factors, and in the case of the effect that diversification and internationalization affect on the business achievement, there needed the following research through longer time series. In order to increase the success possibility of outsourcing and strategic alliance in the future, the result pointed out that many research is required about the role of firm and government.

Chun (2009) shows there was a positive relation between R&D intensity and firm size in manufacturing, but the degree of correlation was less apparent in service. The analysis of each industry shows a positive relation between R&D intensity and firm size in petrochemicals and transport equipment, but R&D intensity did not change according to firm size. The business innovation by R&D and e-business has had mutually supplementary relationship. *Survey of Business Structure and Activities* includes questions on factors related

with R&D and business, such as e-business, diversification, internationalization and management structure. Since the firm's business renovation and R&D usually have an effect on firm's performance *Survey of Business Structure and Activities* has required a long-term panel data.

Figure 2 Matrix of Advance to New Industry (2005-2007)



Source: Kim (2009)

Table 7 Regression Result of R&D Intensity (Manufacturing)

	2005		2006		2007	
	(1) OLS	(2) Tobit	(3) OLS	(4) Tobit	(5) OLS	(6) Tobit
Emp	0.088*	0.345***	0.079*	0.308***	0.164***	0.422***
	(0.045)	(0.095)	(0.041)	(0.093)	(0.050)	(0.107)
$Emp^2/100$	-0.025	-0.387**	-0.013	-0.31**	-0.114*	-0.447***
	(0.063)	(0.155)	(0.051)	(0.142)	(0.067)	(0.165)
CR3	0.003	0.004	0.006**	0.011***	-0.012***	-0.021***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)	(0.005)
Age	-0.013***	0.008	-0.02***	-0.003	-0.033***	-0.020***
	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.007)
Num of obs	6,210	6,210	6,183	6,183	6,251	6,251
R-squared	0.0863	0.0268	0.0858	0.026	0.0807	0.0199

Note: The number in parenthesis are Standard deviations.; ***, **, and * mean each 1%, 5%, and 10% significance level.; Emp-Employee, CR3-Market share of top 3 companies in sales
Source: Chun (2009)

Table 8 e-business Effect on R&D Intensity (2007)

	Total Industry		Manufacturing		Services	
	(1) Tobit	(2) Tobit	(3) Tobit	(4) Tobit	(5) Tobit	(6) Tobit
Emp	0.222**	0.184*	0.337***	0.315***	-0.392	-0.492
	(0.095)	(0.096)	(0.107)	(0.108)	(0.299)	(0.303)
$Emp^2/100$	-0.19	-0.144	-0.339**	-0.313*	1.461	1.674*
	(0.155)	(0.156)	(0.165)	(0.166)	(0.963)	(0.970)
CR3	-0.016***	-0.016***	-0.022***	-0.022***	0.016	0.015
	(0.005)	(0.005)	(0.005)	(0.005)	(0.017)	(0.017)
Age	-0.018***	-0.018***	-0.024***	-0.024***	0.01	0.012
	(0.006)	(0.006)	(0.007)	(0.007)	(0.017)	(0.017)
ebiz	1.603***	-	1.432***	-	2.295***	-
	(0.151)	-	(0.167)	-	(0.363)	-
ebiz - in	-	1.179***	-	1.084***	-	1.569***
	-	(0.151)	-	(0.168)	-	(0.369)
ebiz - out	-	0.834***	-	0.620***	-	1.458***
	-	(0.186)	-	(0.220)	-	(0.377)
Num of obs	8,717	8,717	6,251	6,251	2,466	2,466
R-squared	0.0348	0.0343	0.0223	0.0218	0.0264	0.0262

Note: The numbers in parentheses are Standard deviations.; ***, **, and * mean each 1%, 5%, and 10% significance level.; Emp-Employee, CR3-Market share of top 3 companies in sales, ebiz-Utilization of e-business(1=utilization, 0=non-utilization), ebiz-in - Internal utilization of e-business(1=utilization, 0=non-utilization), ebiz-out - External utilization of e-business(1=utilization, 0=non-utilization)
Source: Chun (2009)

Lim and Lee (2009) analyzed outsourcing of R&D and have summarized the following findings. First, R&D outsourcing was an important strategy to not only large enterprises but also many small and medium-size firms. The 18 percent of firms with R&D activities have outsourced, R&D resulting in the share of external R&D cost in total R&D cost has become in the range of 33 percent to 35 percent.

Table 9 Tobit Regression Result of Weight of R&D Outsourcing

	Tobit (5)		Tobit (6)	
	Coef.	S.E.	Coef.	S.E.
_cons	-1.157***	0.062	-1.181***	0.063
ebiz	0.155***	0.037	0.143***	0.037
PL	0.231*	0.122	0.700***	0.254
$(PL)^2$			-0.436**	0.219
RDINT	-0.007	0.020	1.320***	0.332
$(RDINT)^2$			-0.436*	0.236
RDP	0.084**	0.036	0.056	0.036
Size	2.676***	0.551	6.693***	1.040
$Size^2$			-6.614***	1.504
BHI	0.037	0.086	0.052	0.086
Ind1	0.288***	0.059	0.263***	0.059
Ind2	0.058	0.055	0.003	0.056
Ind3	0.068	0.055	0.037	0.055
Ind4	0.272***	0.056	0.207***	0.058
Ind5	0.419***	0.060	0.396***	0.060
/sigma	0.833	0.026	0.832	0.026
Num of obs.	5589		5589	
Log Likelihood	148.520		201.060	
LR chi2	-2579.615***		-2553.344***	
Pseudo R2	0.028		0.038	

Note: The number in parenthesis are Standard deviations.; ***, **, and * mean each 1%, 5%, and 10% significance level.; ebiz-Utilization of e-business(1=utilization, 0=non-utilization), PL(Technology Level)=the number of patent/employee, RDINT(R&D intensity), RDP-Possession of internal institute(1=possession, 0=non-possession), Size- normalization of sales, BHI(Berry-Herfindahl Index), ind1-chemistry, ind2-electric and electronic , ind3-machinery, ind4-services, ind5-Wholesale and retail trade, and social overhead capital

Source: Lim and Lee (2009)

For firms with relatively lower technology level, outsourcing activity is the way to fill the technology gap, but for large firms outsourcing activity is the supplement to internal R&D.

Second, R&D outsourcing is relatively weak in small and medium-sized enterprises. The reason is not only the lack of R&D ability by themselves, but also the lack of management capacity to perform outsourcing activities. Third, the feature of technological innovation is the results of interaction and networking between universities and firms. Government promotion of the interaction has much influenced in R&D outsourcing activities than internal R&D investment activities. However, external and internal R&D costs are treated in the same way as the tax support to current R&D investment. As a way to encourage networking with university, it seems desirable to find a scheme to grant tax incentives to R&D outsourcing investment more than to internal R&D investment. Fourth, in the process of technological innovation technology outsourcing and R&D outsourcing has been the core way to supply technology from external sources. However, Korean firms have lacked the ability of technology outsourcing on compared with advanced nations' firms. It is important to improve management capacity in terms of technology outsourcing in the future. Thus it is to be highly recommended for firms to accumulate the compound capacity such as know-how (how they can develop technology) for technology innovation, know-why (why technology innovation is important), know-where (where they can get technology) and know-who (from whom they can get technology).

3.3 Determinants of Business Performance and Growth

Determinants of business performance and growth of firms in Korea by Lee and Kang (2009) have shown that higher export share in total sales has negative effects on profitability, labor productivity and growth of firms. These findings are in general contrary to the other existing studies and, therefore, call for special attention or interpretation. Also, the ratio of foreign capital and market share has also negative effects on these performance indicators in the regression of profitability using ROS (return on sales) as dependent variable. Profitability seems to be significantly affected by the turnover ratio of total liabilities and net worth. ROA (return on assets) can be expressed to multiply ROS by the turnover ratio of total liabilities and net worth. If the turnover ratio of total liabilities and net worth is high, ROA cannot be that different even though ROS is low. The regression of profitability using ROA as dependent variable showed that the share of advertising in the total sales affected profitability negatively, but the share of advertising did not affect profitability. However, except for the

regression using ROA, this finding was nor repeated in other regression. The growth regression where growth is defined as the growth rate of sales reported that the expenditure of advertising costs significantly affected positively the growth of firm. Although the effect of advertising costs seemed to be similar to the result of previous researches, the effect of R&D and the number of patent registrations did not produce any significant effect on the growth of firm. The R&D intensity is shown to have a negative effect on the business performance when ROS is used as dependent variable, so that it was opposite to expectation. Patent did not show any significant result. However, the result of the regression should be carefully interpreted considering the following potential problems. First, even though macro factors such as exchange rate variation should be controlled, *Survey of Business Structure and Activities* was not controlled by macroeconomic variables, because the time series of data was very short. Second, in this research, the export was the direct export amount which went through customs clearance under the firm's name not indirect export amount.

Table 10 Determinants of Business Performance:A Synthesis of Regression Results

Variables	ROA (return on assets)	ROS (return on sales)	Labor Productivity	Growth of Firms
Weight of external and import	(-)	(-)	(-)	(-)
Weight of foreign capital	(+)		(+)	
Weight of outsourcing cost	(-)	(-)		
Market Share				
Weight of advertising costs			(- ~)	(+)
Weight of R&D	the first term (-)	the first term (-)	the first term(-)	(+)
The number of patent				

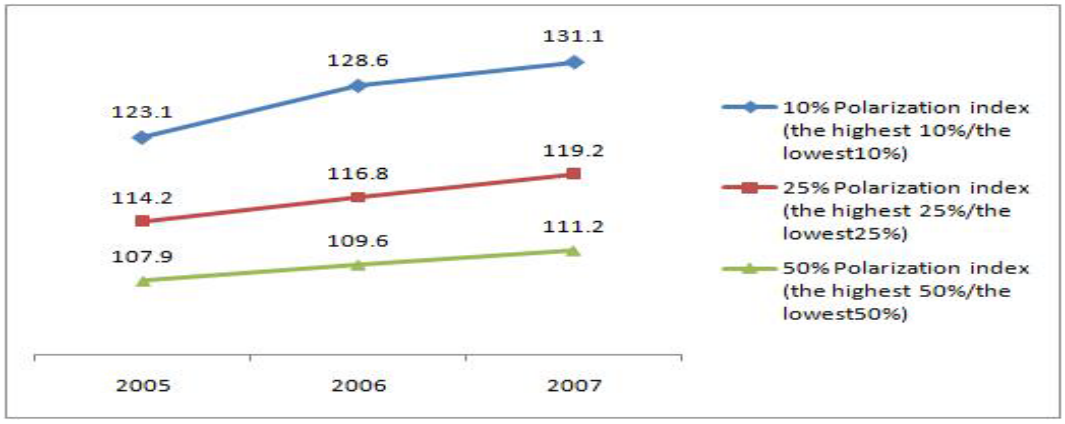
Source: Lee and Kang (2009)

3.4 Comparative Findings with Japanese Firms

Jung (2009) compared the productivity between Korean firms and Japanese firms, and confirmed that sales per firm in 2005 and 2006 were on the average 1.7 times greater than those in Korea. Regarding a firm's average scale, it was observed that there was a significant difference by industry between Korea and Japan. However, Korean firm's net profits were higher than Japanese firms by 10 percent. This means that the net profit rate observed by Korean firms is higher than that of Japanese firms since sales per firm in Korea are less than

those in Japan. While labor productivity in Korea was lower by about 10 percent on the average in 2005 and 2006, capital productivity in Japan was lower by about 10 percent. It was confirmed that the total factor productivity (TFP) of Japanese firms in the manufacturing industry was lower than that of Korean firms by about 2.7 percent. Recent researches have observed that the gap in total factor productivity between Korean firms and Japanese firms has been narrowed. Regarding Korean firms' productivity, the productivity of big corporations was higher than that of small- and medium-sized firms, and that the difference was more pronounced in 2006 than in 2005. Data in 2007 also showed that such polarization was becoming much deeper compared with the previous year. It was also observed that when larger sample firms were used big corporations possess relatively higher productivity. Meanwhile, upon analyzing the catch-up factors, the *Survey of Business Structure and Activities* seem to have produced highly reliable results representing many industries, compared with Jung, Lee and Fukao (2008) which had used samples of listed companies only. Analysis proved that the higher the transparency of a technology in the industry to which a firm belongs, the higher the effectiveness of its catch-up. Also, the big-brother effect of the top ranking firm in the industry was proven to be strongly effective. In other words, an analysis indicates that the leading productivity enhancement of first-rated firms such as Samsung Electronics, Hyundai Motors and POSCO has significantly affected other firms within the same industry through technology transfer, manpower transfer, spill-over in management know-how, strategic alliance in the global market and production networking. Also, by utilizing patent data, the number of patents representing a firm's innovation capacity is found to have a positive effect on productivity catch-up.

Figure 3 Trend of Polarization Index of Total Factor Productivity in Korea



Source: Jung (2009)

Table 11 Comparison of Firm Productivity between Korea and Japan

	2005			2006		
	Korea(A)	Japan(B)	Ratio (B/A)	Korea(A)	Japan(B)	Ratio (B/A)
Labor Productivity (Value Added/ Employees, a hundred won)	96	110	1.14	97	104	1.06
Capital Productivity (Value Added/Total asset)	0.23	0.2	0.86	0.22	0.21	0.95
TFP index	96	100	1.042	98.7	100	1.013

Source: Jung (2009)

Recent empirical research by Fukao and Kwon (2009) using a basic survey on the business activities and the latest JIP database has estimated the total factor productivity trends in Japan among different industries. The rising TFP rate of the market economy as a whole stayed at an average annual rate of 0.2%, but from 2000 to 2005 rose by more than 1% to 1.3%. This research analyzed the productivity trends from 1996 to 2000 and from 2001 to 2005 by using the micro-data of the *Survey of Business Structure and Activities* of which the questionnaire included most of the business activities in Japan. When TFP increase was decomposed by within-effect, reallocation effect, and entry and exit effect, the TFP increase since 2000, either in manufacturing or non-manufacturing, was caused mainly by the within-effect. Regarding dynamic metabolism through entry and exit effects, little improvement was observed. It is interesting to note exit effect on TFP was found to be negative in many industries since 2000.

The analysis on the data of ongoing businesses in order to examine the content of the within-effect showed that considerable part of the acceleration of TFP growth was achieved by restructuring within the firm and that the restructuring was achieved mainly in exporting firms, multinational enterprises, and firms practicing R&D. It was observed that firms whose debt-equity ratio is less than 25% had noticeably low TFP level in the early period but raised their TFP by sharply reducing all production inputs even during the boom periods. The problem of the Zombie firms in Japan is likely to be solved by restructuring rather than removal. Clearly, restructuring accelerated the growth of a firm's TFP. Other factors that contributed to the increase in TFP include technology transfer between parent companies and affiliates, the catch-up effect through the spill-over of technology within the industry, and

progress in internationalization and investments in R&D.

Table 12 Analysis on Determinants for TFP Growth Rate

	Manufacturing	Non manufacturing	Manufacturing	Non manufacturing
	Pooled OLS			
Restructuring firms dummy(Firms to decrease employee over 5% = 1, Not = 0)	0.009 ***	0.006 ***		
	(10.72)	(3.35)		
Restructuring firms dummy(Firms to decrease employee over 10% = 1, Not = 0)			0.015 ***	0.012 ***
			(11.63)	(4.80)
TFP gap (t)	0.204 ***	0.236 ***	0.203 ***	0.235 ***
	(41.06)	(46.29)	(40.93)	(46.22)
Firm's Size (t)	0.006 ***	-0.001	0.006 ***	-0.001
	(14.96)	(-0.75)	(14.77)	(-0.89)
Export intensity	0.016 ***	0.051 ***	0.015 ***	0.051 ***
	(4.41)	(3.01)	(4.24)	(3.01)
R&D intensity	0.165 ***	0.140 ***	0.165 ***	0.137 ***
	(6.32)	(2.73)	(6.34)	(2.68)
Multinational corporate dummy(Firm to invest abroad subsidiary firms = 1, not =0)	0.002 *	0.004	0.002 *	0.004
	(1.78)	(1.35)	(1.76)	(1.35)
Domestic firms' subsidiary company dummy（t）	0.010 ***	0.013 ***	0.010 ***	0.013 ***
	(14.22)	(8.13)	(14.44)	(8.08)
Foreign capital dummy	0.028 ***	-0.001	0.028 ***	-0.001
	(6.76)	(-0.14)	(6.82)	(-0.19)
constant	-0.024 ***	-0.013 **	-0.023 ***	-0.012 *
	(-9.98)	(-2.03)	(-9.56)	(-1.93)
the number of obs.	36,111	40,768	36,111	40,768
R-squared	0.194	0.128	0.195	0.128

Note: Regression is included to industry dummy and year dummy; Thu number in parenthesis is White t value to consider serial; ***, **, and * mean each 1%, 5%, and 10% significance level correlation;
Source: Fukao and Kwon (2009)

The management activities and strategies of firms such as diversification, internationalization, strategic alliance', R&D activities, profitability, and productivity improvement are eventually related with the survival of firms in the market. The life cycle of a firm is the process of entry, survival and exit in the market. Whether this process could be explained through the productivity difference among firms has been an important issue in productivity studies. In other words the higher a firm's productivity is, the better performance of management activities it has. So the possibility of firm's survival will be growing and vice versa.

Empirical research by Miyagawa, Rhee, and Pyo (2009) on the firm dynamics between Korea and Japan has analyzed the productivity growth between entry firms, continuous firms and exit firms and their contribution to the productivity growth of industry through the decomposition of total factor productivity. In general continuous firms tend to have an initiative of the productivity growth due to the entry barrier such as technology level and price barrier. Rhee and Pyo (2008) have found a similar result from Korean firms, and the productivity enhancement of the continuous firms has been also found after strong restructuring process since economic crisis in 1998. Fukao and Kwon (2006) has analyzed productivity trend in Japanese firms, and revealed the higher productivity firms are included among exit firms.

Based on the *Survey of Business Structure and Activities,* Inui et al (2008) has analyzed that there is a reversed U-shaped pattern between market competition and innovation activities of firms. Namely firms have an incentive to conduct innovation to escape from competition. On the other hand other firms that are far from the technology frontier have little incentive to innovate because the productivity gains being derived from innovation activities are small. Firms have devoted to improve productivity through various management activities for surviving in competition, and to intensify the innovation activities in nature. Consequently when technological innovation such as product innovation and process innovation has been achieved, the possibility of survival in the market has improved. Under the globalized economy the competition is challenging. It is to be an inevitable strategy for firms to raise productivity for competitiveness and survival in the market.

Table 13 Decomposition of TFP Growth Rate between Korea and Japan in Manufacturing (%)

	Period	Within Effect (a)	Between Effect (b)	Covariance Effect (c)	d=a+b+c	Entry Effect (e)	Exit Effect (f)	g=e+f	Total Effect (d+g)
Rhee and Pyo(2008)	'92-03	-0.52	-0.48	1.12	0.12	1.47	0.21	1.69	1.81
		(-0.29)	(-0.27)	(0.62)	(0.07)	(0.81)	(0.12)	(0.93)	(1.00)
Fukao and Kwon(2006)	'94-01	1.20	-0.09	0.42	1.53	1.13	-0.52	0.61	2.10
		(0.56)	(-0.04)	(0.20)	(0.73)	(0.53)	(-0.24)	(0.29)	(1.00)

Note: d=Sum of Firm's Within Effect, Between Effect, and Covariance Effect, g=Net Entry Effect
Source: Miyagawa, Rhee and Pyo (2009)

4. Concluding Remarks

As firm activities become diversified, a variety of statistics on firm activities are needed for analyzing firms in various different angles, but existing firm statistics are not sufficient both in depth and coverage. Under this circumstance, National Statistical Office of Korea has launched the development firm statistics on diverse activities by constructing database since 2003. *Survey of Business Structure and Activities* launched in 2006 has surveyed eight fields - the basic information of firms, structure and restructuring of firms, systemization, internationalization, business direction of firms, earning structure and investment, R&D and possession of intellectual property rights, information management and management direction of firms – and the target of the statistics was over 11,000 firms of over 3 hundred millions Won capital and over 50 employees. *Survey of Business Structure and Activities* can provide basic data for industrial policy.

From the viewpoints of policy implementation, the significance of conducting researches on firms is to enable one to understand what firm characteristics can generate higher business performance and to present which policies could be adopted by firms in order to figure out its business strategies. In this regard, based on in-depth analysis utilizing the *Survey of Business Structure and Activities,* this research presents the following policy implications. First, managerial innovation through research and development and e-business was found to have mutually supplementary relations between technological innovation and non-technological innovation. It proves the necessity of integrated industrial support system such as support for the firm's research and development and information-based system. Second, modern technological innovation can effectively motivate the interaction between industries and the academia, and that the core of interaction and networking is the outsourcing of research and development. To promote interaction and networking, the government should realize that outsourcing research and development activities is more important than investing in internal research and development activities. But in the current system of tax support for research and development investments, the external research and development cost and the internal research and development cost are equally treated. As a means to encourage networking between industries and academia, giving greater tax incentives to outsourcing research and development investments than to internal research and development should be explored.

Third, this research proved that the higher the lucidity of technologies of the industry to which a firm belongs, the higher the effect of a firm's catch-up with advanced firms. Also, the effects of the top ranking firm within the industry were very strong to the followers.

In order to provide more concrete and more effective policy implications, researches on firms with diverse concerns related to policy decision-making should be actively pursued and that the *Survey of Business Structure and Activities*, which is a very helpful statistical base, should be developed continually. If the *Survey of Business Structure and Activities* is actively used as basic data for establishing and implementing government's policies and scientific researches, it will greatly contribute to strengthening national industrial policies and researches on firms. Despite the value of the *Survey of Business Structure and Activities* statistics, since it is in the early stage of development, the survey needs to be developed before being completely utilized and expanded.

The first thing to be considered is to build the firm's panel data by continuously securing the time series. For example, in researches on innovation, which is a major research theme for most firms, empirical analysis from other countries reflects time lags before the innovation activities in the firm's business performance and growth. There are limitations in terms of significance in findings since the statistics that are currently used are limited to those for three years only (2005 to 2007). A longer period of time is needed in order to come up with thorough research on the dynamics of firms to investigate what kind of firms attain growth and bring about the growth of an industry.

The second consideration is that efforts should be made to continuously improve statistical survey systems. Many survey items in the *Survey of Business Structure and Activities* need to have economic and scientific definitions. With the continuous exchange and interaction among the users of the statistics, survey items should be defined and adjusted and those who prepare and use these data should cooperate in improving these items. In Japan for example, the research results that utilize micro-data are automatically submitted to the person who prepares the statistics, and the Office of Statistics then examines diverse problems found in the statistics so as to reflect them in improving the data.

Third, the *Survey of Business Structure and Activities* can be utilized in association not only with statistical surveys on diverse businesses that have been produced by the Office of Statistics but also with several other statistics that have been prepared by private firms. If so, the usefulness of the survey's information will drastically increase through synergy effects. Efforts should be made in exploring the effects of developed statistics on firms by improving the statistics with different characteristics and by connecting them with statistics on business entities and enterprises. The value of information inherent to statistics must also be enhanced, which is nothing but the efforts to enhance the productivity of national statistics.

Fourth, the *Survey of Business Structure and Activities* is a full-scale panel statistics on firms. It is therefore important to provide diverse aggregated statisticcal tables. Furthermore, the value of the statistics will be greatly enhanced if it can be actively utilized as micro-data. And upon fully utilizing the micro-data, the difficulties that many researchers and scholars have experienced in carrying out researches on firms will be greatly reduced, if not completely eliminated. Efforts, therefore, should be made to build a base that shall continuously expand the provision of micro-data.

Finally, despite the usefulness and value of the *Survey of Business Structure and Activities* statistics, there has not been much active use of this statistics since they are still in its infant stage. It is important to actively promote and expand understanding of the statistical records and data in order to enhance the productivity of statistics and improve the degree of information resources that are useful on a national basis.

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