Industrial Competitiveness of Korea : Methodology and Findings of KDI's 2003 Study

Cheonsik Woo

KDI

Contents

1. Introduction

1.1 Motivation

Recent economic depression and unemployment issues have amplified the concerns regarding the competitiveness of Korean industries. Strengthening industrial competitiveness is one of the most important issues that the Korean economy faces. A vast amount of arguments and policy efforts on the issue have been made since the economic crisis, however, the growth engines of the Korean economy in the twenty-first century have not been clearly identified, which has been the cause of the increasing concerns and doubts about the competitiveness of Korean industries.

What is the current status of Korean industries' competitiveness, and what will happen in the future? What are the best policy tools to strengthen them? These are the questions that this study attempts to answer. In this study, we tried to develop the methodologies to identify the structural problems of Korea's industrial competitiveness and the schemes to solve them, and to provide thorough empirical studies which can be utilized in further arguments and policy efforts.

Based on a model in which competitiveness is considered with special attention to supply chain and value chain, this study analyzes the factors pertaining to industrial competitiveness at three stages; (i) trade and financial performances as the 'final outcome variables' of competitiveness, (ii) productivity as the 'intermediate outcome' of competitiveness and (iii) R&D and FDI as the structural determinants of competitiveness. In this study, we tried to provide a systematic analysis based on as various statistics as possible.

Utilizing the analyses on these factors pertaining to the industrial competitiveness, we analyzed the competitiveness of the five major industries in the manufacturing sector and of the business service industry. The five industries in the manufacturing sector are electronics, automobile, chemicals, machinery, and textiles and garments, which account for 50 percent of GDP, 60 percent of employment and 70 percent of exports from the total manufacturing sector. The Business service industry is included in this study for its significance in increasing the productivity of the manufacturing sector. In analyzing the competitiveness of these industries, we tried to make a thorough analysis of the "distribution in the industry," instead of just observing the "industry average," by decomposing the industries into sub-industries according to the supply chain and into sub-groups according to firm sizes. In addition, we performed interviews with about one hundred companies in order to complement the possible shortcomings of the qualitative analysis.

<Table 1-1>

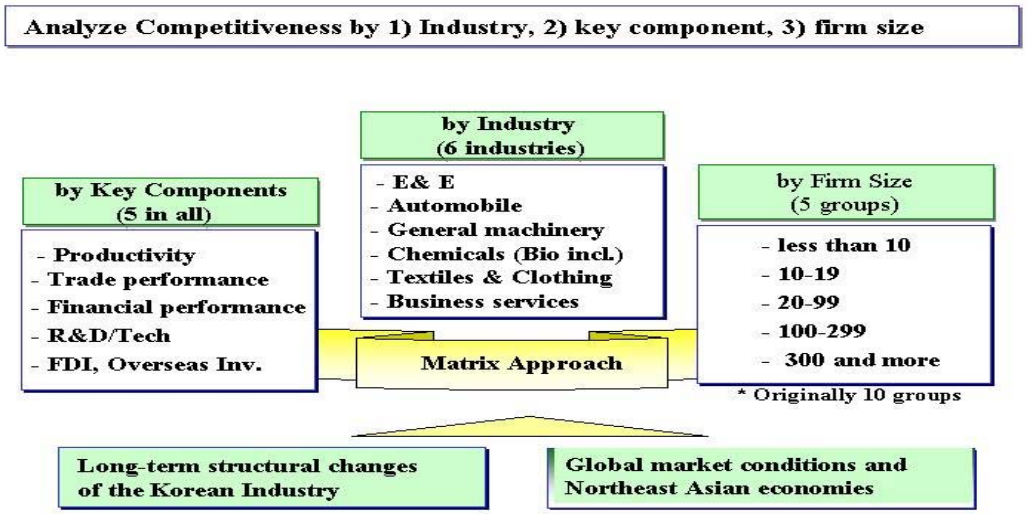
Analysis of Components	Analysis of Industries
- Productivity : Labor. Capital, TFP - Trade : RCA, Trade Specialization, ES, Market Share - Financial : Profitability, Stability, Growth-potential, EVA	- E&E : 4 mid − groups, 9 sub-groups - Auto: 2 mid-groups - Machinery : 3 mid-groups, 13 sub-groups - Chemicals : 3 mid-groups, 14 sub-groups - Textiles& Clothing : 4 mid-groups, 11 sub-groups

Each sub-sector also divided into 5 size groups
Quantitative analysis complemented by interviews and surveys

This study is the result of a collaborative project by the Knowledge Economy Division, KDI, and every member of the Division participated in the study. This report comprises of sixteen Chapters in three Parts; introductory chapters in Part 1, analyses on various factors pertaining to competitiveness in Part 2, and analysis of competitiveness by industry in Part 3. Major statistics and estimation results can be found in the Statistical Appendix accompanying this report.

The structure of the report is such that statistical analysis and modeling apply to every component, and the report follows the "matrix approach" in which Part 2 (analysis of various

factors pertaining to industrial competitiveness) provides the analytical tools for the Part 3 (analysis of competitiveness by industry) which, in turn, are reflected in Part 2 at the same time. The ultimate purpose of this approach was to provide a comprehensive and consistent analysis on the industrial competitiveness of Korea.



<Figure 1-1>

In this study, we tried to draw policy implications and strategies for attaining competitive advantage, and, in particular, the implications as to the "bifurcation" or "polarization" hypothesis and as to the employment and distribution issues. However, this part was limited to a minimum level since the main goal of the study was to provide basic empirical results. This is the limitation of this report as a policy study, and is to be complemented with future research giving more emphasis to policy factors of industrial competitiveness.

1.2 Methodology

Empirical parts of this study consists of the analyses on the structural changes in the Korean industry, changes in trade patterns, productivity and other factors pertaining to competitiveness, for the period 1980~2001.

The most important feature of this study is that it analyzes the competitiveness with much emphasis given to the "supply chain." In this study, we tried to provide a comprehensive analysis on the sources of competitiveness by utilizing as various statistics as possible, and, for this purpose, we performed detailed analyses on the five major industries considering the supply chains in each industry.

Another peculiar aspect of this study is that it is based on a consistent sectoral classification system. Specifically, this study uses the national income statistics, input-output tables, plant-level manufacturing survey data, UN's trade data, firm-level financial data, and so on, which are originally compiled by their own classification systems. In this study, we re-compiled all the statistical data by the same 29-sector classification system of the KDI Multi-Sector Model. Here, the goal was to provide consistent and comparable empirical results.

Components of the empirical study are as follows; first, an analysis on the structural changes in Korean industry is performed using the national income statistics and input-output tables. This part consisted of the analyses on (i) the structural changes in the major variables

such as gross output, gross domestic product, final demand, import and export, and employment, (ii) the changes in the input-output relations using input coefficients and various inverse matrix coefficients, and (iii) the trade performances. Second, sectoral productivity analysis was performed, which is the most critical factor in studying the competitiveness. We used the plant-level manufacturing survey data, and estimated various productivity indices by industry, sub-industry and firm size (five categories based on the number of workers: less than 9, 10~19, 20~99, 100~299, and 300 or more). Productivity indices estimated in this part are labor productivity, capital productivity and total factor productivity, and, when estimating the total factor productivity, we employed both the growth accounting method and the multilateral index method. Third, we analyzed the trade performance of Korea in order to estimate the competitiveness realized in the world market. We used UN's trade data in addition to the national income statistics and input-output tables, and estimated various competitiveness indices such as market share, export similarity index, revealed comparative advantage index, and trade specialization index at industry and sub-industry levels. Fourth, we used firm-level financial data to estimate various profitability and financial indices, an important factor of competitiveness, at industry and sub-industry levels and for various firm sizes. Finally, considering the important roles of R&D and FDI on competitiveness, we thoroughly reviewed the R&D activities of Korean companies using the statistics provided by the Ministry of Science and Technology, and we performed empirical studies on the inbound FDI and overseas investment.

<Table 1-2 > Data Compiled and Applied

	Structural Change (National level)		Competitiveness Analysis					
Data Source	Change in industrial structure	Change in trade pattern	Trade Perform	Produc-tivity	R&D &FDI	Financial Perform	I/O Relation	Individual Industry
NIA(80-01)	O	Δ	Δ	Δ				O
I/O(80-00)	O	Δ	Δ	Δ			O	O
Employment Annex of I/O	O			Δ				O
Manufacturing Survey (84-01)	O		O	O				O
Firm's financial record (90-02)				Δ	O	O		O
UN Trade Data (92-00)		O	O					O
S&T/R&D Survey					O			O
FDI(in/out/active) (80-02)					O			O

**Whenever possible, all data were processed consistently according to the industrial classification of KDI's multi-sector model

2. Analysis on Various Factors Pertaining to Competitiveness

2-1. Structural Changes in Korean Industry

The Korean economy has experienced gradual changes in its industrial structure since the 1980s, where, as the industrialization process matured, the share of manufacturing became saturated while service sectors as a whole tended to take more portion in gross economic activities. The manufacturing sector has started to account for smaller shares in the late 1980s. However, its shares have recovered to the previous level after starting to increase in the second half of the 1990s: the manufacturing sector has shown the high growth rate since the mid-1990s. And productivity in the manufacturing sector has been greatly improved; particularly, high

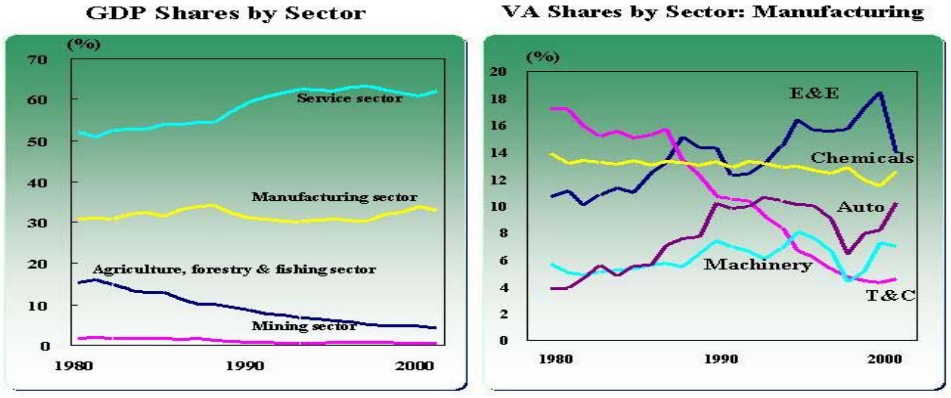
productivity increase is found in manufacturing firms that survived the financial crisis with successful restructuring.

Over the long-term period, the manufacturing sector maintained a stable level, whereas the service sector has been stagnant. Above all, productivity in the service industry is lower than that of manufacturing. In this regard, even though the service industry takes a larger share in terms of employment, its share is constant in terms of added value. This fact implies that enhancing productivity in the service sector is the crux of raising the overall economic growth rate.

Within the manufacturing industry, intervals of business scales widen both in inter- and intra-sectors. Its expanding gaps in inter-sectors are the most evident in inter-sectoral differences in terms of growth rate and total factor productivity (TFP) growth. The electronics and automobile sectors lead a large part of the growth rate of the manufacturing industry and TFP growth. Especially, these growth rates are ascribable to the rapid productivity increase mainly by large conglomerates since the 1990s. Furthermore, according to findings of productivity analysis of manufacturing by sub-sectors and by five groups of firm-scale, the higher growth rates are found in electronics and automobiles, with the larger share led by conglomerates. And these conglomerate firms make a higher contribution to the growth rate of productivity and increasing productivity. These analysis results show that large conglomerates are expected to maintain the leading role in the growth of the manufacturing industry for the time being. In contrast, except for the smallest firm-cohort with less than 10 employees, smaller firms show poor records in productivity growth. The productivity improvement of smaller firms is an important task for sustainable growth and improvement of the competitiveness in manufacturing in general.

The phenomenon of widening gaps among inter-sectors and inter-firms which we call bifurcation or polarization is also identified in the analysis of financial structure. According to the results analyzing financial stability and profitability from 1990 to 2002, while both total assets and tangible asset investments have been on a downwards trend since the financial crisis, the gaps widen between large conglomerates and SMEs. In addition to this deepening polarization, signs of a decrease in increasing rate of tangible assets give rise to apprehension in light of an expansion of growth potential. However, as KDI study noted in the chapter reviewing R & D activities of firms, we have found a positive sign of the possibility that the Korean economy is in the process of transforming into an innovation-driven economy as the number of technology-intensive SMEs dramatically increases after the financial crisis.

Structural change in the Korean Industry

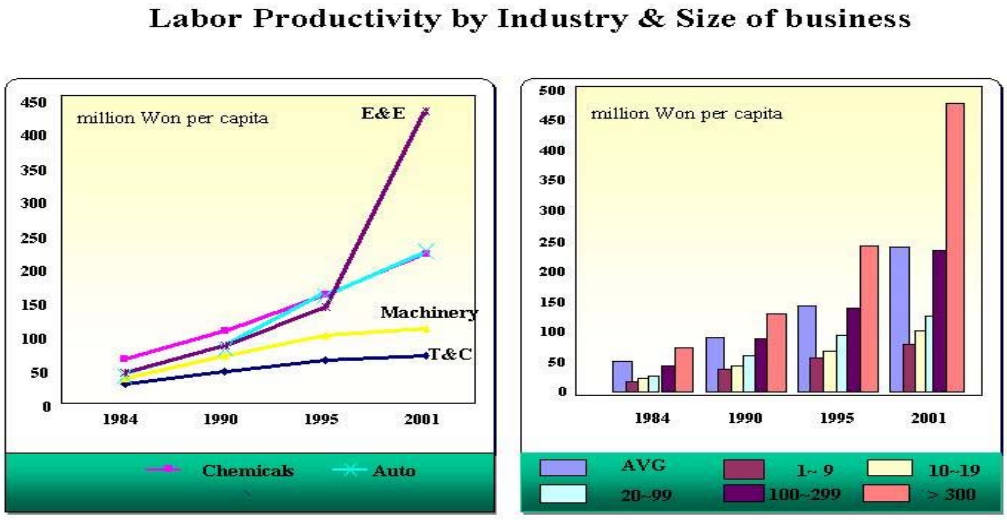


<Figure 2-1>

2-2. Productivity

The main goal of this chapter is to estimate various productivity indices of the various industries in the manufacturing sector. We used the plant-level manufacturing survey data for 1984-2001 compiled by the National Statistical Office. The data were re-compiled according to the 29-sector classification system of the KDI Multi-Sector Model, and, for five major industries, the data were rearranged into sub-industries according to the supply chain in each industry. The plants were classified into five categories according to the number of workers, and the analysis was performed for three sub-periods; 1985-89, 1989-97 and 1998-2001. We estimated both single-factor productivity, such as labor productivity and capital productivity, and total factor productivity (TFP), which was estimated by both the growth accounting method and multi-lateral method.

(1) Labor Productivity: Huge gaps of labor productivity were observed among industries and among size groups. The basic metals and electronics industries showed high labor productivity while textiles and garments, metal products, precision instruments industries showed a low level. We could also find that larger plants recorded higher labor productivity for the entire period, and that the gaps are widening. Analysis on the growth rate of labor productivity also showed a similar pattern. Specifically, the electronics industry showed an overwhelmingly high growth rate, and machinery and transportation equipment industries showed comparably high growth rates, while textiles and garments, paper products and publishing, and metal products industries recorded extremely low growth rates. Overall growth rate has persistently risen, with an exceptionally low growth rate right after the economic crisis. Analysis on the growth rate of labor productivity by plant size reveals an important result. We found that, over the entire period, larger plants recorded higher growth rates. However, we found, in addition, that smaller plants showed higher growth rates in the first sub-period (1985-89), that this trend reversed in the second sub-period (1989-97), and that the gaps widened in the third sub-period (1998-2001) when productivity growth was led mostly by large firms.

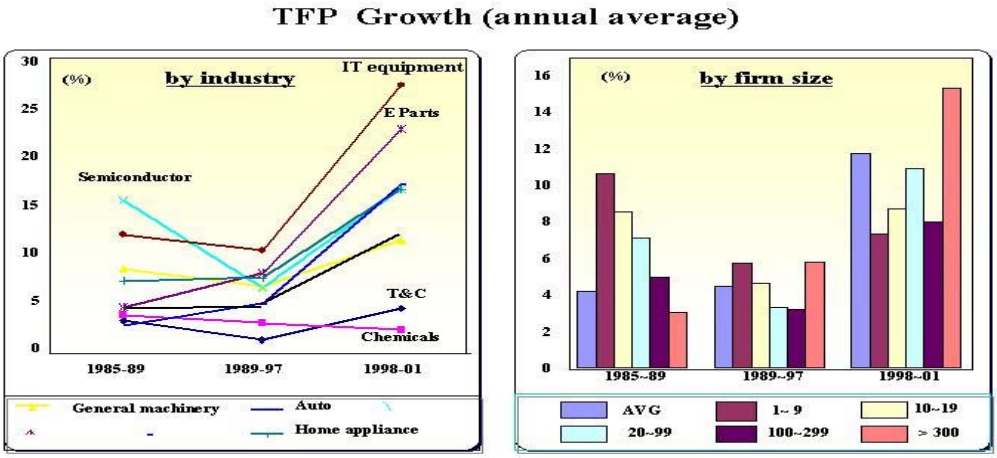


<Figure 2-2>

(2) Capital Productivity: Capital productivity shows a relatively stable time-series, and the gaps among industries and among firm sizes are reducing, except for several industries.

Capital productivity by plant size shows an "inverted U" shape, i.e., the plants with medium size show the highest capital productivity.

(3) Total Factor Productivity (TFP): Annual average growth rate of TFP for 1985-2001, computed by the growth accounting method, for the entire manufacturing sector was estimated to be 4.33 percent. It was estimated slightly higher than 4 percent until the late 1990s, but rose sharply up to 11.68 percent after the economic crisis. The food and beverage, textiles and garments, and precision instrument industries showed slow TFP growth for the entire period, while the electronics industry showed an extremely high TFP growth rate, high enough to lead the TFP growth of entire manufacturing sector. The machinery and transportation equipment industries, in addition to electronics industry, also recorded high TFP growth rates, and these industries recorded remarkably high TFP growth in late 1990s. Growth pattern of TFP by plant size shows a trend highly similar to that of labor productivity. That is, smaller firms revealed higher TFP growth rates in the first sub-period, but the trend reversed in the second sub-period, and the gaps widened in the third sub-period. Estimation by multilateral index method showed almost the same results.



<Figure 2-3>

In conclusion, it can be said that the growth and technological progress of the manufacturing sector has been led by the electronics and automobile industries, and, in particular, by the fast productivity growth of large firms in the 1990s. This can be explained by the fact that the shares of large firms are relatively big in the industries with fast productivity growth.

It is expected that the growth of the manufacturing sector led mostly by large firms will persist for the time being. At the same time, however, it is necessary to pay special attention to the increasing share of smallest firms and to the slow productivity growth of medium-size firms (with 100 to 300 workers), since it would be impossible to sustain a high growth rate and improved competitiveness in the manufacturing sector without sufficient productivity growth of small- and medium-size firms.

2-3. Trade Performance

We analyzed the trade pattern of Korea through various indices such as market share, export similarity (ES) index, revealed comparative advantage (RCA) index, and trade specialization (TS) index at industry and sub-industry levels. The UN's trade data for the period 1992-2000 were used for this purpose, which, originally compiled by SITC, were re-compiled

under the 29-sector classification system of the KDI Multi-Sector Model. The trade performance of Korea and the degree of competition among three countries - Korea, Japan and China - were evaluated by market shares and ES indices, while RCA and TS indices were used to analyze the current state of comparative advantage and the dynamics of trade pattern of the above three countries. In addition, we also analyzed intra-industry trade (IIT), i.e., the trade of "similar" goods, based on the UN's trade data for the period 1989-2002.

Estimation results clearly revealed the complementary and substitutive relations of the major industries among the above three countries. Korea recorded high export and market shares in IT equipment, semiconductors, textiles and apparel, and chemical products, while China in textiles and apparel and IT equipment's, and Japan in automobile, general machinery, IT equipment's and chemical products. In case of Korea and China, the shares of textiles and apparel were decreasing, while those of IT equipment's were increasing. Korea showed high and increasing export and market shares of semiconductors. On the other hand, Japan showed a relatively stable export structure, with high shares of automobiles, general machinery, electronics and chemical products. Japan's trade pattern revealed a comparative disadvantage in textiles and apparel, and electric appliances, while Korea in food products and beverages, precision and general machinery, and metal products, and China in automobiles, semiconductors, precision and general machinery, and chemical products.

All three countries showed high market shares and export similarity in the field of electronics, which seems to stem from the activities of the multinational companies that started establishing production bases in China since the 1990s and increasing exports. In recent years, China has overtaken Korea rapidly in the export of electronics (except semiconductors), and the competition between the two countries has also risen in the trade of precision instruments and metal products. Between Korea and Japan, export similarity in the field of automobiles was at the highest level, while competition between Japan and China was rising in shipbuilding as well as electronics.

Reviewing the TS indices, we could find that China was gaining competitiveness in almost every industry, that Japan was losing competitiveness in most industries except chemical products, and that Korea was enhancing competitiveness in more industries. China's competitiveness was improving in the trade of products with positive TSI such as electric appliances, miscellaneous manufactured products and metal products. In addition, IT equipment's, automobiles, and shipbuilding, previously net-imported (i.e., negative TSI), became net-exported, and the TSI's of chemical products, semiconductors, electronic components, general and precision machinery, and basic metals, though negative, have been improving recently. In case of Japan, on the other hand, only chemical products showed positive and improving TSI, while the TSI's of other products are falling. Korea's competitiveness was improving in the trade of metal products, electric appliances, automobiles and shipbuilding (goods with positive TSI) and of chemical products, petroleum and coal products, and electronic components (from negative to positive TSI). On the other hand, Korea was losing competitiveness in the trade of textiles and apparel, semiconductors, IT equipment's, and miscellaneous manufactured products (goods with positive but declining TSI) and of food and beverage, and basic metals (goods with declining negative TSI).

We performed the analysis of industrial competitiveness through IIT indices in addition to the study of inter-industry trade. Trade between Korea and Japan and between Korea and the US showed a pattern such that vertical IIT dominates horizontal IIT, which implied that Korea could produce and export "similar" products to the US or Japan, but with lower quality and price. We could not detect any evidence that the gaps were narrowing. On the other hand, we found increasing horizontal IIT between Korea and China, which implied that the quality and price of China's products were approaching those of Korea's. We also found that IIT with ASEAN, unlike IIT with China, was not increasing fast.

TSI(trade specialization index) analysis

	Korea	China	Japan
(+) --> (+), but improved leading export group	Auto, shipbuilding, home appliances, metal	T&C, home appliances, metal, other manufactures	Chemicals
(-) → (+) New export group	Chemicals oil & coal, Electronic parts	IT equipment, automobile, shipbuilding	None * (+) → (-) in home appliances)
(-) → (-), but reduced Prospective export goods w/ import substitution	General machinery Precision machinery	Semiconductor, E-parts, primary metal general machinery, chemicals, oil & coal, Precision machinery	None (-) intensified: in food & drink, t&c. oil & coal etc.
(+) → (+), but reduced losing group	T&C, semi-conductor, IT equipment, other manufacturing	Food & drink, non-metallic mineral	Auto, shipbuilding, IT equipment, E-parts, semiconductor Machinery metal processing, etc.

<Figure 2-4>

2-4. Profitability and Financial Performance

We analyzed financial performance measures for each categorized firm-size of major manufacturing industries with the data of National Information & Credit Evaluation Inc. over a thirteen year period (1990-2002). In the analysis, we investigate empirically not only the various financial performance measures but also the value-based performance measures, EVA (economic value added).

Major empirical findings for the thirteen-year period are as follows; First, The profitability of domestic manufacturing companies in general displays an improving trend after the 1997 financial crisis even though there were significant differences between large enterprises and SMEs (small and medium-sized enterprises). For instance, ordinary income to sales of large enterprise and SME were 2.4% and 0.2%, respectively between 1990-1997, and these trends continued after the financial crisis as well as for ordinary income to total assets and interest expenses and ordinary income to total assets.

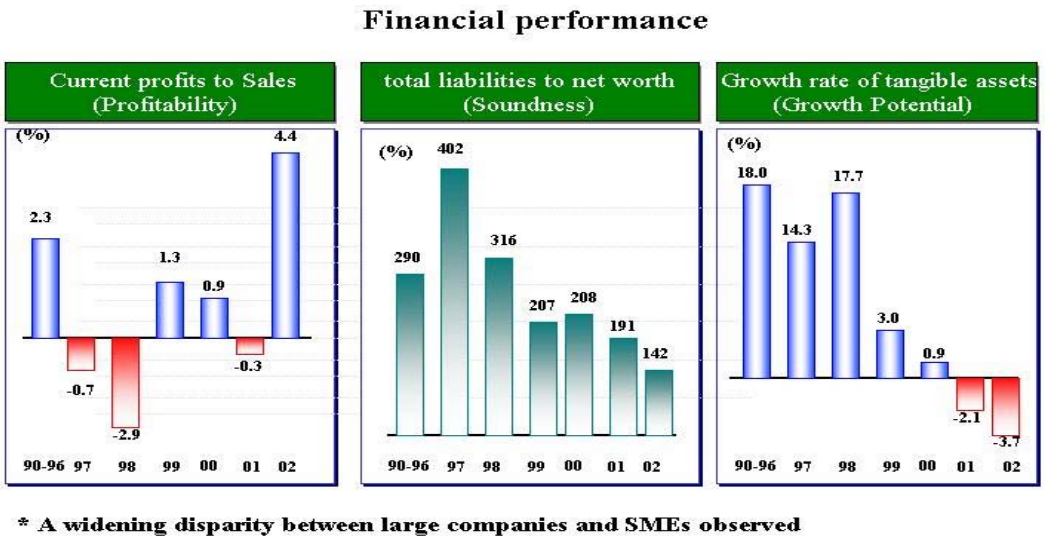
Second, the difference in the growth rate of sales between large enterprises and SMEs, one of the indicators concerning growth, became larger than those before the financial crisis. Especially, the growth rate of tangible assets of both of large enterprises and SMEs, which is the prior index of investment, has a declining trend after the financial crisis due to companies dormant facilities investment. Furthermore, the ratio of decline of SMEs is larger than that of large enterprises.

Third, the capital structure of companies was significantly improved. The debt-to-equity ratio fell to 213% during 1998-2002 compared to the 290% during 1990-1996. However, the average debt-to-equity ratio was 269% during the period of analysis. Meanwhile, their profitability gradually improved thanks to the decline in the cost of capital and results from the restructuring efforts.

EVA (economic value added) is a measure of a firm's profit after subtracting the cost of all capital employed. It is defined as operating profits after taxes minus cost of capital. The average growth ratio of EVA was 22.3% for 1991-1996 but was 1.8 trillion in 1998 that is almost -40% of the preceding year. However, after recording a fall in 2001 there was a remarkable increase (79.8p%) in 2002. Major empirical results of EVA for each industry recorded almost

positive values that means firms produced economic value. But SMEs experienced significant declines after the financial crisis.

The conclusion to be drawn from this analysis is that the results are mixed. In other words, we could not find the financial performance characteristic in the major industry, meaning that firm size is more important than each industrial characteristic in producing financial performance. Korean manufacturing companies have shifted their economic management goals from being a growth-based strategy to inward building for profit following the financial crisis in 1997. Therefore, the difference of financial performance between the Korean firms and the advanced countries is gradually reducing. While the average debt-to-equity ratio of the companies was reduced, it was not led by the efforts of companies but mainly by the government's restructuring efforts and financial agents. Therefore, it is imperative that domestic companies sharpen their competitive edge so that they can produce stable profits regardless of outside situations with efficient and continuous investment and gradual reduction of the debt-to-equity ratio.



<Figure 2-5>

2-5. R&D and Technological Competitiveness

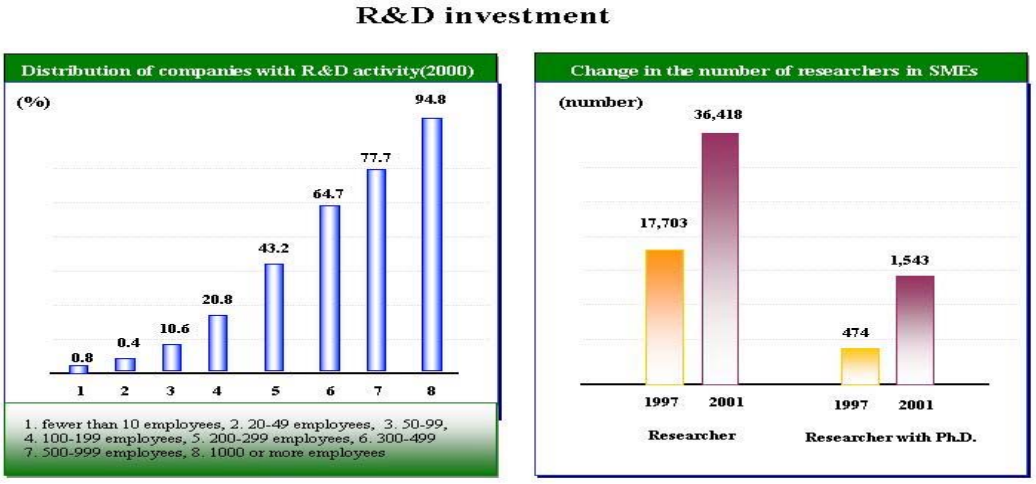
"Technological competitiveness" is the concept used when considering technology as a comparative advantage, competitive advantage, or a determinant of competitiveness. Previous studies on technological competitiveness can be classified into two categories; (i) to estimate indices based on objective statistics, and (ii) experts' analysis based on subjective evaluation. The former has been widely used in international comparison as in OECD's STI Scoreboard, while the latter focuses on specific industries or products as in technology foresight, and technology roadmap.

In this study, we adopted the method to compare the R&D investments by top 200 Korean companies with those by top 500 global companies, in order to evaluate Korea's technology level. Gross R&D investments of Korean companies, which once showed a sharp decrease after the financial crisis in 1997, recovered to the level before the crisis in 2000, but is still far behind those by top global companies. R&D investments by the top Korean companies in each industry are about 30% of the average of the R&D investments by top 500 global companies, and are about 15% when excluding Samsung Electronics. R&D intensity - the ratio of R&D investment to the total sales - of the Korean companies is estimated to be 2.0 percent, by

far lower than that of the global companies, 4.2 percent. Furthermore, R&D intensity of the top 200 Korean companies decreased from 2.2 percent in 1996 down to 2.0 percent in 2000, while that of the top 500 global companies increased from 3.9 percent to 4.2 percent during the same period, thus widening the gap between Korean and global companies. When looking at the R&D intensity by industry, we can find that the share of R&D investment in the ICT industry is considerably high in other countries, but it is quite concentrated in the ICT industry in the case of Korea, with lower intensities in pharmaceuticals and machinery. More importantly, we can find that the correlation between the R&D intensity and the growth rate of total sales is quite high in the case of top global companies, but is extremely low in the case of Korean companies, which implies insufficient contribution of R&D investment to the growth of the companies.

We could find that the share of the R&D investment by large companies in total private R&D is at a high rate, with dominant shares by top large companies. We could also find, however, that the share of R&D investments by small- and medium-size companies has gradually increased since the economic crisis in 1997. Specifically, an analysis of the R&D activities of the private companies since the economic crisis until 2001 revealed a decreasing share among large companies and an increasing share among small- and medium-size companies. We could also find that more small- and medium-size companies are performing R&D activities, and that the number of researchers they hire increased dramatically; total number of researchers increased from 17,703 in 1997 up to 36,418 in 2001, and the number of researchers with Ph.D.s increased from 474 in 1997 to 1,543 in 2001. On the other hand, the number of researchers hired by large firms decreased in the same period, with a marginal increase in the number of researchers with Ph.D.s.

R&D intensity of small- and medium-size companies also increased in the same period, from 2.81 percent in 1997 to 3.69 percent in 2001, while that of large companies decreased from 2.05 percent down to 1.99 percent. While it could not be said that this trend applies to most small- and medium-size companies, we could find positive signs of technological improvement for the small- and medium-size companies, when considering the increasing importance of technology in terms of competitiveness as well as the increasing number of technology-based small companies.



<Figure 2-6>

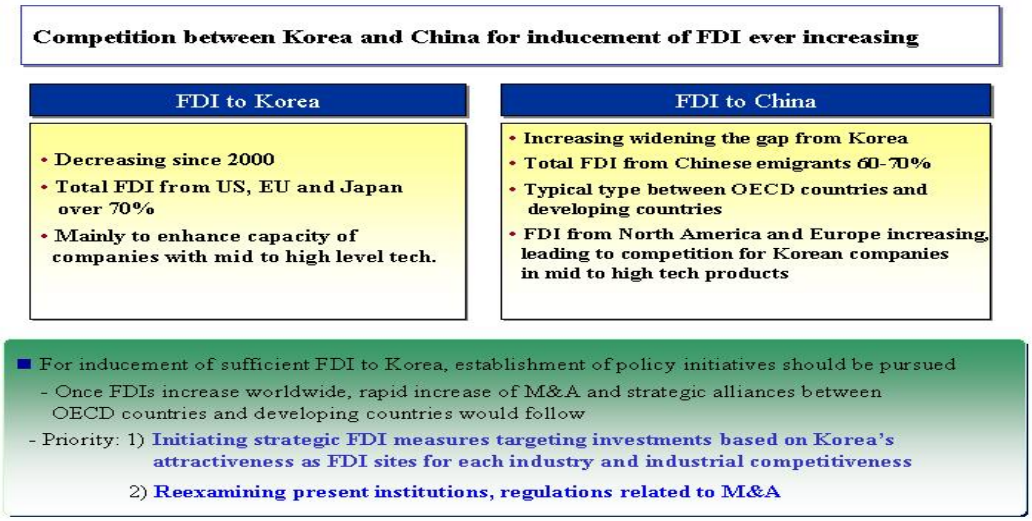
2-6. Inbound and Outbound Foreign Direct Investment in Korea

Since 2000, Korea has experienced a sudden downturn in the amount of FDI (Foreign Direct Investment) inflow which has continued ever since. In addition, most of the FDI have been gravitated toward Seoul and Gyeonggi Province, and this gravitation has intensified even more since the crisis. The FDI into China, on the other hand, has reached a record high, making the gap between the growth rate of FDI amount into Korea and China bigger than ever.

According to the analysis performed to examine the effect of inbound FDI on productivity, the productivity of firms with FDI is higher than that of non FDI domestic firms with other things being equal. When the intra- and inter-industry productivity spillovers are examined, the coefficients of intra-industry and downstream industry FDI share are both found to be positive and significant. The backward productivity spillovers are especially bigger and more significant among all the variables, and are not affected by the model specification and share calculation method employed. The forward productivity spillover effect, on the contrary, appears to be unstable in terms of sign and significance. Depending on the model specification and share calculation method, it even appeared to be negative and significant in some cases. The existence of such effects, regardless of their direction, provide evidence on the public good aspects of FDI and thereby can be a rationale for governmental intervention in the course of attracting FDI.

In the case of outbound FDI, the size decreased drastically after the crisis, though lately it is showing some signs of recovery. While there has been sharp increase in the amount of outbound FDI into China, especially in the small and medium enterprise sector, it is uncertain whether this trend can last considering there is only a limited number of domestic firms that have capacity to penetrate Chinese market.

In general, FDI is known to raise productivity and to promote industrial restructuring through the transfer of advanced production and management technologies, not to mention increase in investment and employment. FDI would thereby raise the level of production and technological innovation in Korea.



<Figure 2-7>

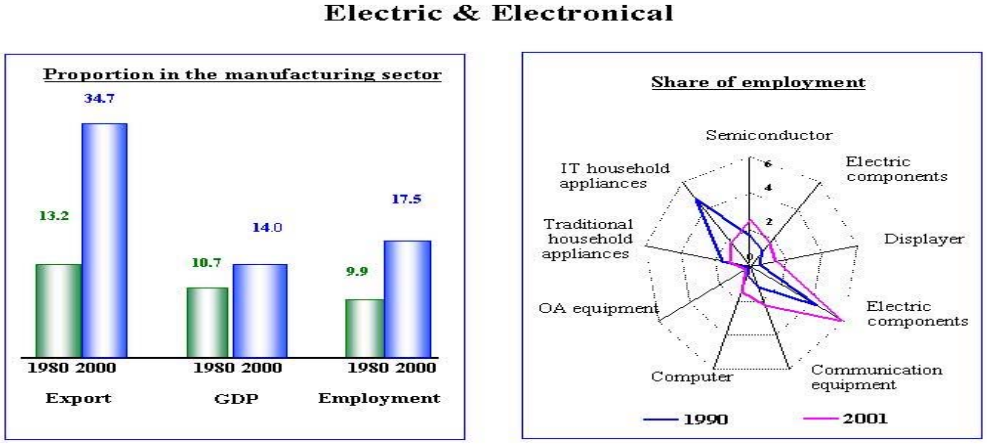
While the world FDI market is also suffering from stagnation, there is a very high possibility that this market could revitalize in the near future. If it does, there will be a rapid expansion of M&A and strategic alliances among advanced countries and developing countries. Korea still possesses an advantage over China in terms of high value-added activities and industries. As long as we manage to innovate the strategy and propulsion system of attracting FDI, we can expect a turnaround that could take Korea out of recent stagnation in investment and the gravitation of FDI into China. This must be preceded by building a strategic FDI-

attraction-system, improving the investment incentive system and M&A related laws and regulations, lifting the entry barrier of a national R&D system to FDI firms, etc.

3. Analysis of Competitiveness by Industry

3-1. Electronics

The Korean electronics industry is characterized as a dual structure or an unbalanced structure. It is comprised of large conglomerates that play a leading role both in domestic and global markets and the remaining groups of companies that are weak in their technological competence. Considering the electronics industry in general, competition with China is fierce in such sectors as computers and home appliances where price plays a key role in competitive advantage. The Chinese competition is relatively low in such sectors as memory chips particularly semiconductors and display units where non-price factors, for example technological leadership, are more important. Of particular interests is the dramatic increase of global market share by Chinese firms in communication equipment, rising as one of Koreas major competitors, presumably due to the roles of MNEs in China. The obstacles to further development of the electronics industry will be found in its dual structure, such as gaps between conglomerates and SMEs in both inter and intra-sectors. While leading conglomerates that have global business strategies can maintain their competitiveness through procurement of parts all over the world; the development of industries in general cannot be sustained without improving competitiveness of firms at a lower level. This conclusion implies that the government should make more efforts to rectify the dual structure, which indicates the importance of nurturing smaller technologically agile firms.

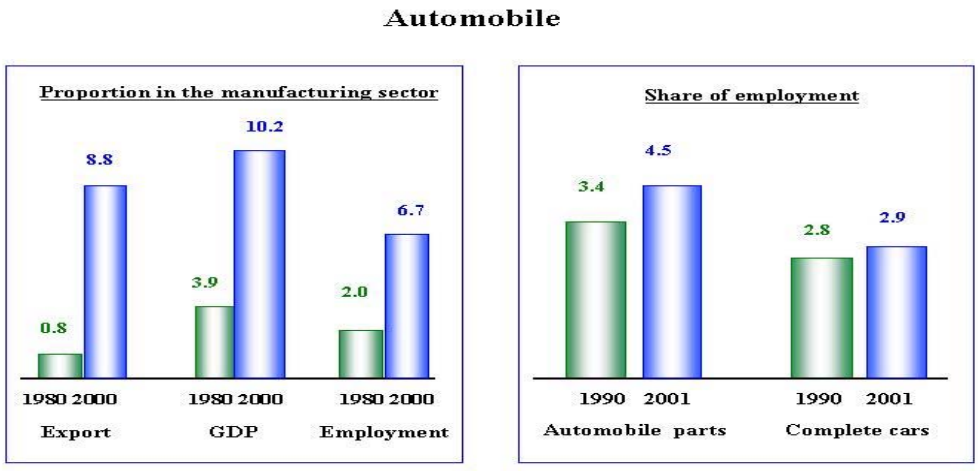


<Figure 3-1>

3-2. Automobile

The dual structure is found also in the automobile industry - the bifurcation of industry into the two groups of companies: final auto assemblers, led by conglomerates, and component suppliers made of SMEs at the lower level. While the final assembly sector is assessed to have a competitive advantage that enables them to penetrate into overseas markets, the persistent weaknesses of parts suppliers is expected to be a vulnerable element to the competitiveness of the automobile industry in general. Whilst modularization has become important in securing competitiveness in the parts industry, it is currently being implemented

as a way of reducing costs for automobile components in order to compensate for wage differentials between final auto assemblers and parts suppliers. As R&D becomes the most critical strategic element in sharpening competitive edge, first-tier companies as well as many second and third-tier ones expand their R&D investment. Still, one of the biggest obstacles for the parts suppliers is the shortage of high-skilled labor in the production line due to their wage differentials compared to final assemblers. Owing to business restructuring after the financial crisis and the progress of market opening and the IT revolution, parent companies' global sourcing is strengthened. In this circumstance, conglomerates dealing with component suppliers have faced a turning point, changing from the previous vertical relationship. Competence of parts suppliers is weak in such areas as independent technological development, purchasing & sales, and capabilities of collecting information on global market trends, mostly relying on the parent companies. Whereas Chinese enterprises have higher price competitiveness, they lag behind Korea in terms of the level of technology, which delays the rise of Chinese firms as threatening competitors to Korean firms. However, building up firms' core competence requires accumulation of long-term experience. Taking into account that Korean parts makers do not have a considerably higher capability of developing technologies compared to Chinese firms, it is expected that Chinese firms would catch up to Korean firms in the near future. An upgrade in the quality of work force is needed to strengthen innovation capabilities and to expand the production capability of parts suppliers to the level where scale-economies is realized.

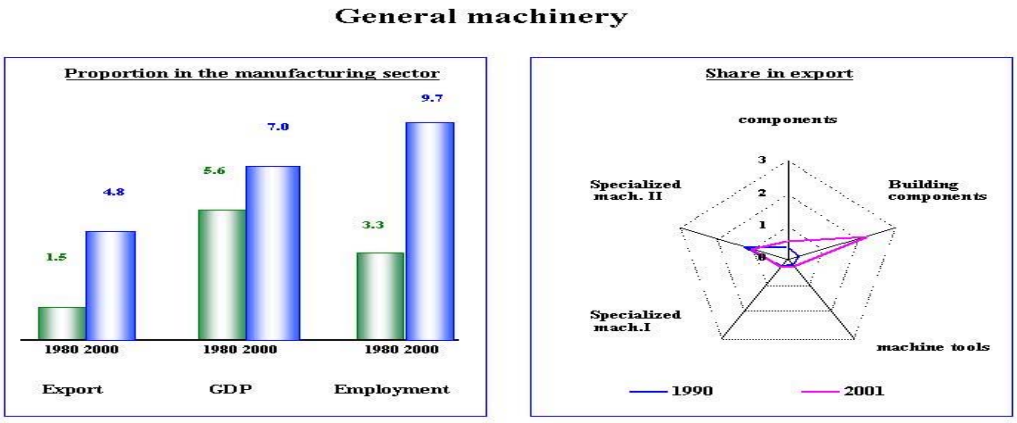


<Figure 3-2>

3.3. General Machinery

The machinery industry faces a challenge to transform its current production system to one that is based on generic technologies, which enables to the production of differentiated products. In general Korea's machinery producers show dexterity in manufacturing and assembly, where company competitiveness originates. On the other hand, competitiveness is found to be low in the specialized machinery sector, which requires integration and application of new technology. This characteristic is largely due to the industrial structure of the machinery industry that is composed of, mostly, SMEs. The efficient and competitive production structure can be idealized as one where, when SMEs specialized in core parts and materials strongly support industrial base and conglomerates perform large-scale projects as well as lead the machinery industry. Ninety-eight percent of the Korean machinery industry is composed of SMEs based on the number of enterprises. As the majority of them are small

scaled with the sales composition made mostly of single products, they lack sufficient competence to function as the bedrock of the machinery industry due to poor motivations for technology development. In contrast, big companies do not in general reach such stages as they can lead the development of the overall machinery industry, even though they achieved business rationalization through restructuring processes after the financial crisis. Therefore, a pressing task is to consolidate the system-base of the industry, a system where specialized firms are closely linked through supply chains and innovation networks. It is also urgent to improve technological capability in machinery design and generic technologies, where Korea has big gaps compared to advanced countries. To accomplish this task, it is necessary to promote the inward investment of foreign companies, who are leading the global industry, as well as reinforce industry-academia linkages.

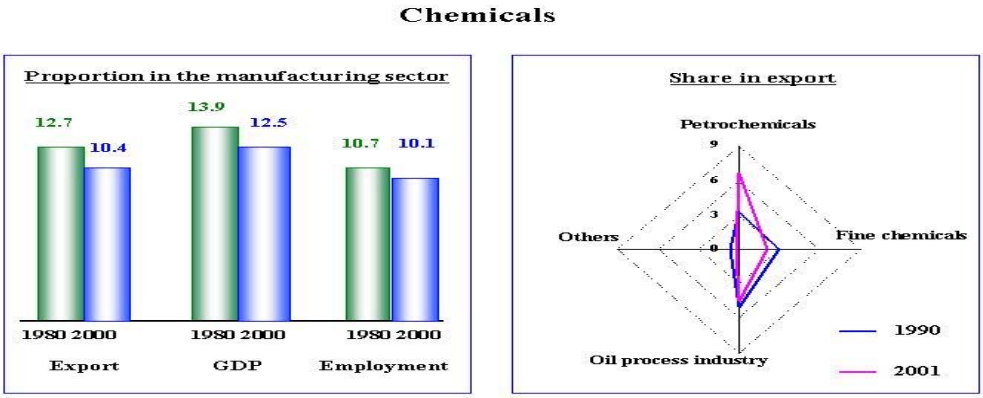


<Figure 3-3>

3-4. Chemicals

The chemical industry includes such diverse industries as petrochemicals, fine chemicals, and rubber and plastic. While it is linked with a series of production chains, obvious differences are found in each sub-sector in terms of production structure, required technologies and others. While there has been a slight decrease in value of production, the amount of export, and share of value-added just after the financial crisis, the chemical industry has recently experienced a recovery trend and some products meet global standards in light of production scale. There are contrasts between capital-intensive industries as petrochemicals and rubber and plastic and technology-intensive fine chemicals. Whereas the petrochemical sector, led by large conglomerates, has an export to production ratio of over 40%, with a high comparative advantage index, the fine chemical sector mostly remains oriented toward domestic demands with a lower competitiveness index in the global market. In terms of productivity, the petrochemical industry generally attains a high level of productivity due to the high capital intensity, while that of the fine chemical industry is low. However, a high level of competitiveness does not necessarily relate to a higher level of productivity in petrochemicals compared to fine chemicals. Without adjustment of the excess facilities and R&D efforts for new products, its current competitiveness cannot be maintained. In the chemical industry in general, prerequisites for sustained growth are, among others, development of new businesses and innovation of production process. Especially, the industry in general should re-orient its growth strategy to explore new markets through the development of differentiated products thus changing the current strategy of focusing on standardized products. More large companies are to be induced to enter into the fine chemical sector which is currently comprised of mostly small companies, and thus playing a leading role

in the development of the industry as a whole. In tandem, the government should make more efforts to rationalize the industrial structure by inducing autonomous restructuring of over-capacity in petrochemicals and enhancing cooperation between large firms and smaller firms.



<Figure 3-4>

3-5. Textiles and Garments

The textiles and garment industry has been gradually taking smaller shares since the 1980s. However, they still occupy a key position with 15% of total employment in the manufacturing sector as of 2001. They took larger shares in exports in spite of a slowdown in their exports with 13.9 billion dollars in the black in 2000. As domestic textiles and garment industries have tended to lose their competitive edge in general, the long-term trend of industrial decline is expected to continue. Considering the textiles and garment industries in general, recovering to the levels of their heydays is difficult to expect. Yet, the textiles and garments sectors still have potential for further development, with strategic specialization in the sectors of synthesis yarn and synthesis fabrics, where Korea has a high degree of competitiveness and strengthening design and brand marketing which enables to climb up a higher ladder of quality. For instance, developing super-functional textile materials and their commercialization is important for preventing a radical decline in the domestic textiles industries, as well as upgrading industrial structures. Reactivating the fiber and textiles sectors requires a creation of demand in the garment industry. It is also essential to create a demand of apparel with fashionability and marketability. Furthermore, innovation of a distribution system in the garment industry is critical for overcoming limitations of market size and creating further demand. Additionally, an initial generation of market environment is also required for domestic textiles businesses to convert into various kinds of small lots through formulating a distribution network of fashion clothes with low and medium price levels.

<Figure 3-5>

3-6. Business Service

The business service industry is included in this study for its significance in increasing the productivity of the manufacturing sector. In the last ten years, the business service industry's significance in the economy has increased worldwide. In 1999, the share of GDP in the business service industry was 14.5 percent in UK, 12.6 percent in Germany, 7.3 percent in Japan, 6.0 percent in US and 5.8 percent in Mexico. On the other hand the share of the sector in Korea was only 3.8 percent, which implies a great growth potential in the future.

Under-developed market has been the major cause of the sector's slow growth in the past. Thanks to the improvement of certification and qualification systems and to the progress of information technology, however, the business service sector has recorded a rapid growth in recent years in terms of GDP, gross output and employment, with a few exceptions for several sub-industries.

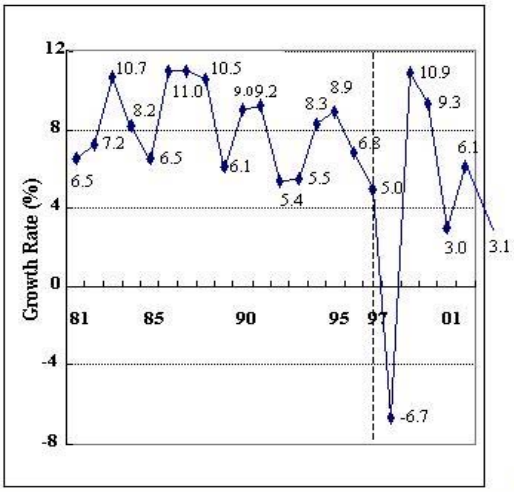
Nevertheless, it should be said that the quality and competencies of the sector are not adequate at this stage, mainly due to the small size and to the insufficient experience of the sector. In order to foster the sector, much efforts are necessary to enhance the trustworthiness of the service providers by enlarging the market size via M&A, enhancing specialty, improving the quality and competencies of service, and promoting careful after service.

<Figure 3-6>

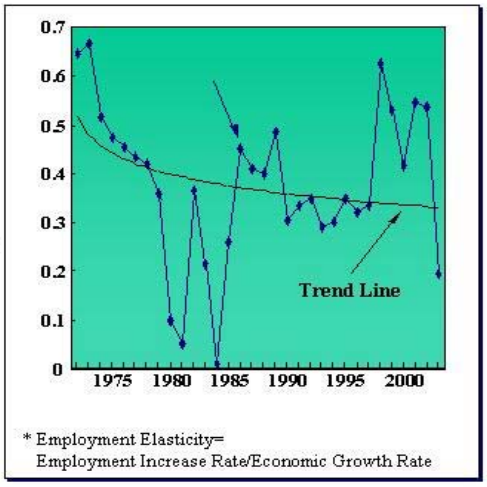
<Annex 1>

Concern over Jobless Growth

Growth Rate (1981-2002)



Employment Elasticity (1970-2002)

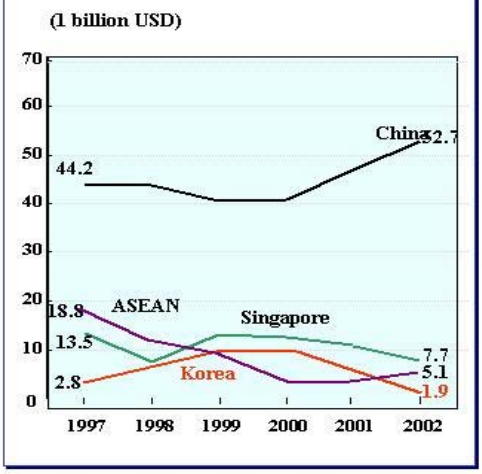


* Employment Elasticity=
Employment Increase Rate/Economic Growth Rate

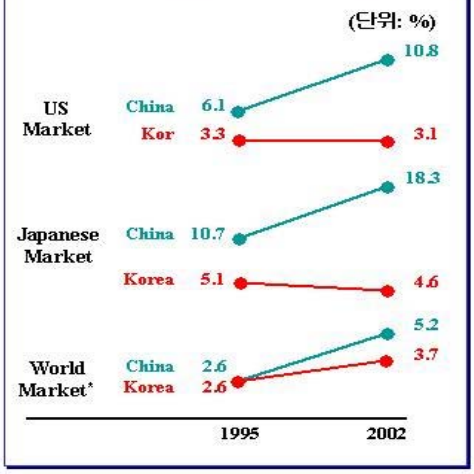
➢ **Trouble Sources: Business downturn, Inflexible labor market, Lower job-absorption of the manufactures**

Suring-up of China

FDI inflows into East Asia

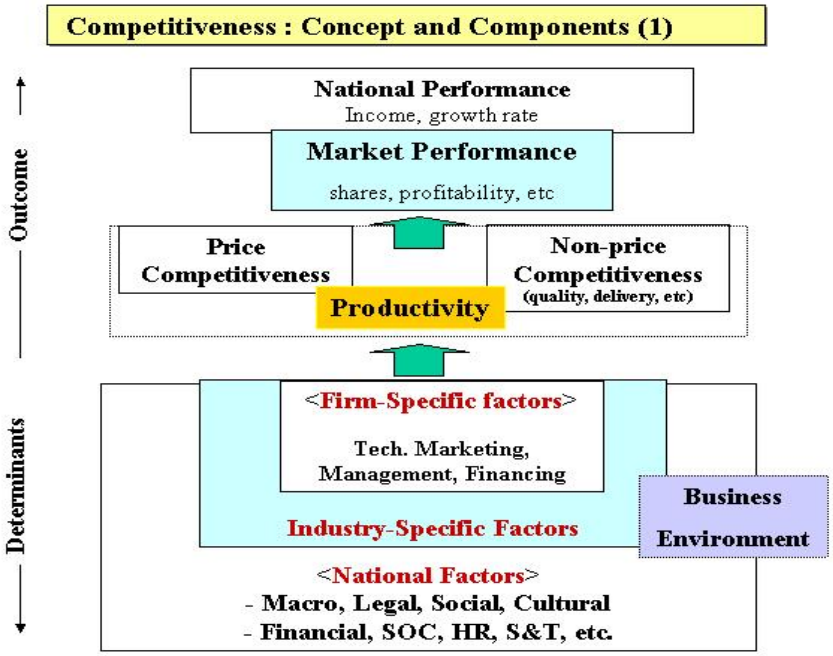


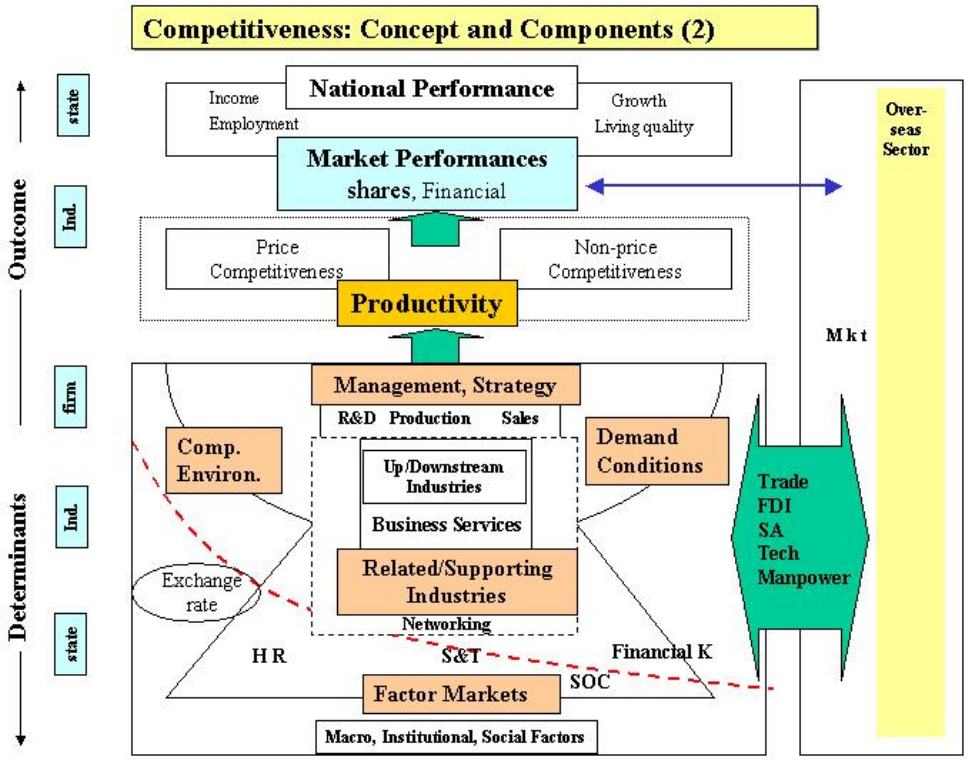
Korea vs China: Market Shares



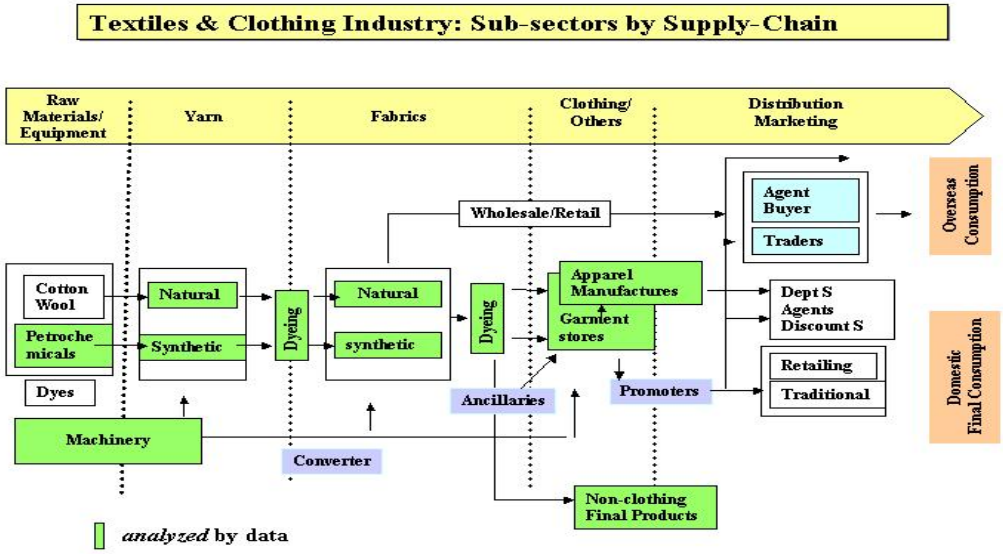
Source: UNCTAD

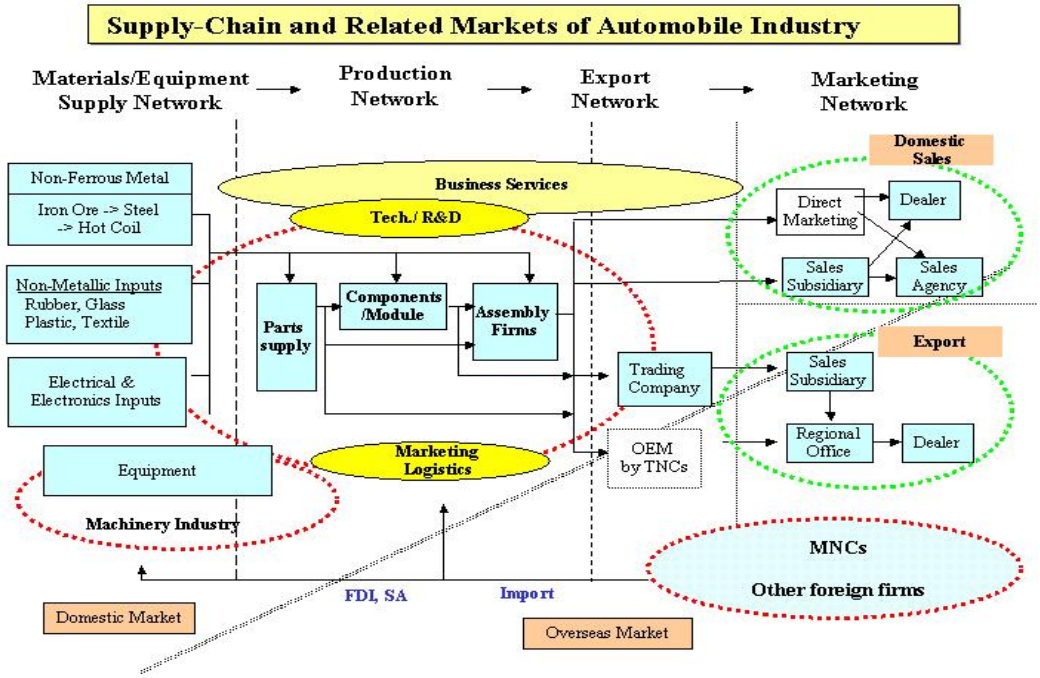
<Annex 2>


Competitiveness : Concept and Components (1)
Outcome
National Performance
Income, growth rate
Market Performance
shares, profitability, etc
Price Competitiveness
Non-price Competitiveness
(quality, delivery, etc)
Productivity
Determinants
<Firm-Specific factors>
Tech. Marketing, Management, Financing
Industry-Specific Factors
Business Environment
<National Factors>
- Macro, Legal, Social, Cultural
- Financial, SOC, HR, S&T, etc.


Competitiveness: Concept and Components (2)
Outcome
Determinants
state
Ind.
firm
Ind.
state
National Performance
Income
Employment
Growth
Living quality
Market Performances
shares, Financial
Price Competitiveness
Non-price Competitiveness
Productivity
Over-seas Sector
Mkt
Management, Strategy
R&D Production Sales
Comp. Environ.
Up/Downstream Industries
Business Services
Related/Supporting Industries
Networking
Demand Conditions
Trade
FDI
SA
Tech
Manpower
Exchange rate
HR
S&T
Financial K
SOC
Factor Markets
Macro, Institutional, Social Factors

<Annex 3>


Textiles & Clothing Industry: Sub-sectors by Supply-Chain
Raw Materials/ Equipment
Yarn
Fabrics
Clothing/ Others
Distribution Marketing
Cotton Wool
Petroche micals
Dyes
Natural
Synthetic
Dyeing
Natural
synthetic
Dyeing
Wholesale/Retail
Apparel Manufactures
Garment stores
Agent Buyer
Traders
Dept S Agents Discount S
Retailing
Traditional
Overseas Consumption
Domestic Final Consumption
Machinery
Converter
Ancillaries
Promoters
Non-clothing Final Products
analyzed by data


Supply-Chain and Related Markets of Automobile Industry
Materials/Equipment Supply Network
Production Network
Export Network
Marketing Network
Non-Ferrous Metal
Iron Ore -> Steel -> Hot Coil
Non-Metallic Inputs
Rubber, Glass Plastic, Textile
Electrical & Electronics Inputs
Equipment
Machinery Industry
Business Services
Tech./ R&D
Parts supply
Components /Module
Assembly Firms
Marketing Logistics
Trading Company
OEM by TNCs
Domestic Sales
Direct Marketing
Dealer
Sales Subsidiary
Sales Agency
Export
Sales Subsidiary
Regional Office
Dealer
MNCs
Other foreign firms
FDI, SA
Import
Domestic Market
Overseas Market

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