ECONOMIC PERFORMANCE OF HIGH-KNOWLEDGE INDUSTRIES VS LOW-KNOWLEDGE INDUSTRIES IN KOREA

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Establishing a knowledge-based economy has emerged as a means of attaining the basis of sustainable growth in the Korean economy even after the IMF era comes to an end. Building a knowledge-based economy, however, requires a thorough study on the internal structure of the entire Korean economy. Some experts emphasize implementing high-tech or service industries into the current industrial structure while others think that manufacturing sector should continue to play a central role even in the knowledge-based economy. Out of Korea's GDP, the traditional manufacturing sector accounts for a substantive portion(about 30%) in spite of the fast growth in the service sector and high-tech manufacturing sector since the mid 1990s.

Moreover, Korea's leading exporting sectors are all in the manufacturing industries. In light of this, it is still important to foster competitiveness in the manufacturing sector. Fostering competitiveness could be accomplished by enhancing the R&D effectiveness, enlarging the capacity of knowledge sharing, or boosting capability to produce knowledge-based output. Classifying manufacturing industries by knowledge intensity and assessing the economic performance of each group, therefore, would be a valuable work which should be followed by a more rigorous study on this matter.

Classification of Korea's Manufacturing Sector by Knowledge Intensity

The degrees of knowledge intensity of manufacturing industries can be analyzed by the method developed by

Table 1. Classification of Manufacturing Industries by Knowledge Intensity

Knowledge Intensity	Manufacturing Industries
High-Knowledge Industry	① Coke, Refined Petroleum Products ② Chemicals and Chemical Products ③ Machinery Outfits ④ Machinery for Office, Calculating, Accounting ⑤ Electrical Machinery & Converters ⑥ Televisions and Communication Equipment ⑦ Medical, Precision and Optical Equipment ⑧ Motor Cars and Trailers
Medium-Knowledge Industry	① Other Transport Equipment ② Pulp, Paper and Paper Products ③ Publishing, Printing and Recording ④ Manufacture of Rubber & Plastic Products ⑤ Non-metallic Mineral Products ⑥ Assembling Metal-Products & Outfits ⑦ Furniture
Low-Knowledge Industry	① Food Products and Beverages ② Manufacturing of Tobacco Products ③ Textiles ④ Wearing Apparel and Furs ⑤ Tanning and Dressing of Leather ⑥ Wood and Wood Products ⑦ Basic Metals ⑧ Recycling

Lee and Has(1996). According to their study, the R&D Activity Indicator and the Human Capital Indicator comprise the knowledge intensity. In the case of Korean industries, one should use various proxy variables for the R&D Activity Indicator: R&D expenditure, the proportion of R&D personnel to total employment and the proportion of professional R&D personnel to total employment. For the measurement of the Human Capital Indicator, the ratio of employed scientists/engineers to total employment, college graduates' ratio to total employment, and knowledge workers[1] ratio to total employment can be used. An industry is considered as high knowledge if these two indicators(R&D Indicator and Human Capital Indicator) belong to the top one third. By the same token, an industry is classified as low knowledge industry when two indicators are in the lowest one third. The classification results are reported in the table.

Analysis of Economic Performances

The high-knowledge industry group has highest share in terms of output of the total manufacturing industry's output. The share of the high-knowledge sector increased from 46.9%, in 1993, to 51.3%, in 1996. On the other hand, that of the medium-knowledge sector has not changed considerably during same period, while that of the low-knowledge sector decreased from 30.9%, in 1993, to 26.5%, in 1996. Examining the output growth of each sector, the high-knowledge sector

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shows the biggest growth. The high-knowledge sector kept the highest output growth rate, at annual growth rate of 19.7% from 1993 to 1996.

Analyzing the rate of value-added and the number of patents granted for each group, it was found that the high-knowledge sector excels other groups. It had the highest value-added rate and number of patents granted. What is interesting is the case of medium knowledge industry. The medium-knowledge sector had the lowest knowledge producing level among three groups; it had the lowest value-added per worker and its number of total patents granted per output was almost the same as the low-knowledge sector.

Regarding the openness of industries, the high-knowledge sector exhibited the highest, followed by the medium-knowledge sector and low-knowledge sector. Openness was estimated by the export/output ratio and (export+import)/output ratio. Considering the fact that higher export industries are regarded as more (internationally) competitive ones in the Korean economy, knowledge intensity is a decisive factor in the industry competitiveness.

In addition to the knowledge producing and international competitiveness, high knowledge industries excel others in employment and labor productivity. But what draws attention is that low knowledge industries are better than the medium industries in labor productivity. A similar result is found when one compares the capital/labor intensity. High knowledge industries come first and medium knowledge industries come second.

Implications

The apparent findings which were reported above confirm that domestic manufacturing sector is under restructuring in which high-knowledge industries are growing fast while the share of

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1) Workers in the fields of natural sciences and engineering are included. General white collar workers specializing in social sciences, medical sciences and other professional fields are also included.

Table 2. Knowledge Producing

	Output Share			Value Added***		Total Patents Granted***	
	1993 (%)	1996 (%)	annual* growt rate(%)	value added/gross output(%)	value added/employ-ment(times**)	number	number /gross output
High	46.9	51.3	19.7	42.5	1.25	4,507	0.02
Medium	22.2	22.2	16.2	46.9	0.93	941	0.01
Low	30.9	26.5	10.4	41.8	1.00	1,076	0.01

Source: National Statistical Office, Ministry of Labor.
Note: 1) * annual growth rate of gross outputs from 1993 to 1996.
2) ** indexed numbers when the low knowledge industry's performance is 1.00.
3) *** data of 1996

low-knowledge sector is shrinking. The economic performance of the high-knowledge sector was the highest in terms of gross output, value added, patents granted, international competition, and productivity. Based on this performance analysis, it can be said that the high-knowledge sector should be a "strategic target" sector in the future. As the openness degree of the high-knowledge sector was much higher than other two sectors, it appears that it possesses higher international competitiveness than others. However, the comparative advantage of the high-knowledge sector in the global market is lessened somewhat since the import-dependence of the high-knowledge sector is quite high.

The reason for this is that the high-knowledge sector depended on imports for the intermediate capital goods and raw materials. How to make this sector independent of the imported goods should be a central agenda in the industrial policy in the future. Another

implication is about the medium-knowledge industries. It was found that the growth rate of the medium-knowledge sector was the lowest while its share in total output is higher than the low-knowledge sector. However, the value-added rate per worker and the number of patents granted in the medium-knowledge sector are lower than those of low-knowledge sector. These findings indicate that the use of knowledge is less efficient in the medium-knowledge sector.

Based on this study, following suggestions can be made for an appropriate industrial policy. First, the competitiveness of the high-knowledge sector could be enhanced through fostering related industries, which produce parts and intermediate goods. Second, one should elaborate ways to enhance the efficiency of knowledge usage in the medium-knowledge sector. Third, continuous efforts for restructuring in each industry should be coupled with pecuniary investment in order to increase its productivity. **VIP**

Table 3. Degree of Openness

	Export Ratio	Openness
High-Knowledge	55.7	50.7
Medium-Knowledge	37.5	30.6
Low-knowledge	6.7	28.6

Source: Bank of Korea, ┌1993 Input-Output Tables┘, 1996.