COMPETITIVENESS ASPECTS OF OPERATIONS IN KOREAN MANUFACTURING INDUSTRIES

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Competitiveness of Korean manufacturing industries

In Korea, the manufacturing sector still constitutes an important and productive part of the Korean economy. The gross output and value added of the manufacturing sector has increased approximately 425,007 billion won, 176,729 billion won, respectively. The productivity of the manufacturing sector, measured in terms of value added per worker, increased from 23 million won in 1990 to 76 million won in 1998. Also, its share of labor costs in the value added fell from 27% to 19% in the same period.

This is most likely the result of increased automation and facility investment. However, despite external growth, it is not adequately addressed as to how individual competitiveness of Korean manufacturing industries, which is represented by operational performance, is ranked.

This analysis aims to investigate the relative capacity of the various manufacturing industry groups in Korea in using their resources to create products that generate rich revenues.

Measuring the operational competitiveness of Korean manufacturing industries will help reveal their performance characteristics and trends, which would be of considerable interest to government policy makers, investors and company managers. This analysis aims to investigate the relative capacity of the various manufacturing industry groups in Korea in using their resources to create products that generate rich revenues. Unlike the method of IMD's national competitiveness rating, we call this the capability index operational competitiveness based on productive efficiency.

Data and Methodology

The sample of this analysis was 23 Korean manufacturing industries listed in an annual Report on Industrial Census (Enterprise) published by the National Statistical Office. In this survey, Korean manufacturing industries are organized into the following 23 broad groups as shown in the box below.

Moreover, this analysis covers the operations of Korean manufacturing industries during 1990 to 1998. And, we use the recently developed Operational Competitiveness Rating (OCRA) procedure (explained in the last part) to measure the competitiveness of individual manufacturing industries. The relative inefficiencies are computed using input data in the form of costs of input-consumption (wages &

Table 1. Manufacturing Industries by Category

D15. Food products and beverages	D27. Manufacture of basic metals
D16. Manufacture of tobacco products	D28. Assembling metal-products & out fits
D17. Manufacture of textiles	D29. Machinery and outfits, n.e.c.
D18. Wearing apparel and fur articles	D30. For office, calculating, accounting
D19. Tanning and dressing of leather	D31. Electrical-machinery & converter n.e.c.
D20. Wood and products of wood and cork	D32. Television and communication equipment
D21. Pulp, paper and paper products	D33. For medical, precision and optical
D22. Publishing, printing and recording	D34. Motor cars and trailors
D23. Coke, refined petroleum products	D35. Other transport equipment
D24. Chemicals and chemical products	D36. Manufacture of furniture and n.e.c.
D25. Manufacture of rubber, plastics products	D37. Recycling
D26. Non-metallic mineral products	

salaries, major production cost) and output data in the form of output-generating factor (Gross output, Census value-added).

Analyzed Results

We first examined the top 10 manufacturing industries' overall competitiveness during a 9-year period at the aggregate level (see Table 1). According to Table 1, D37 (recycling) is especially evaluated as number 1 and, although it is not shown in Table 1, D32 (Television and communication equipment) ranks lowest in competitiveness. In addition, Table 1 shows that these rankings are stable over the 9-year period covered by our data.

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However, it is surprising that D37 (recycling) ranked as the lowest industry for financial ratios such as value added per employee, and ratio of value added to sales. Usually, the reason for this includes that individual financial ratios were dif ferent

Table 2. Overall Competitiveness Ranking (Top Ten)

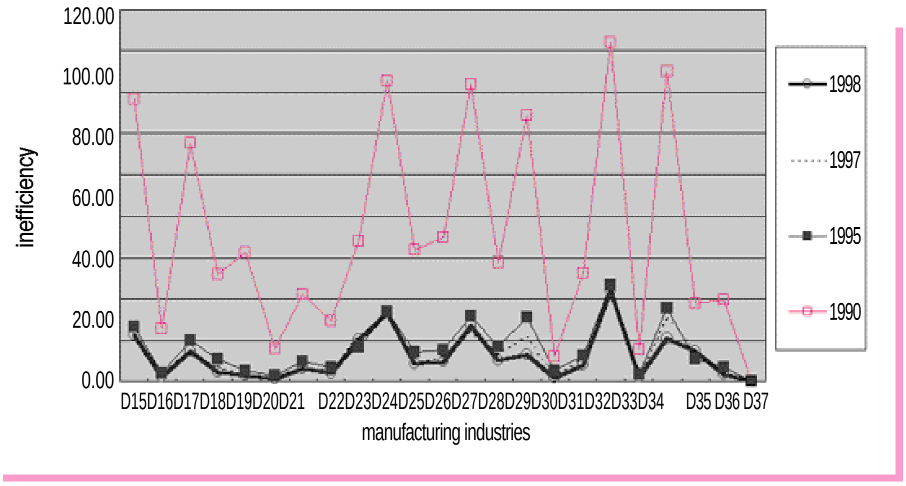
ranking	1998	1997	1996	1995	1994	1993	1992	1991	1990	average
1	D37	D37	D37	D37	D37	D37	D37	D37	D37	D37
2	D20	D20	D20	D20	D20	D33	D30	D30	D30	D30
3	D30	D33	D16	D16	D16	D20	D33	D33	D33	D20
4	D33	D30	D30	D33	D33	D30	D20	D20	D20	D33
5	D16	D16	D33	D30	D30	D16	D16	D16	D16	D16
6	D19	D19	D19	D19	D19	D22	D22	D22	D22	D22
7	D36	D36	D36	D36	D22	D36	D36	D36	D35	D36
8	D22	D22	D22	D22	D36	D19	D21	D21	D21	D21
9	D18	D21	D21	D21	D21	D21	D18	D35	D36	D19
10	D21	D18	D18	D35	D18	D35	D19	D18	D31	D18

from overall competitiveness due to the weighting distribution of criteria.

In estimation and evaluation of competitiveness, the weighting of the evaluation criteria is critical in overall score. In our approach, an input cost category is assigned a relative weighting value that is in proportion to the costs incurred in that category. A revenue category is assigned a relative weighting in a similar manner. This approach has some similarity to the entropy method where an attribute with relatively large variation receives a larger weight.

While these results provide important information, additional analysis is needed to analyze how overall competitiveness is determined in respect of resource consumption and revenue generation. In order to reveal more implications, resource consumption and revenue generating inefficiency is further depicted in Figure 1 and Figure 2.

Figure 1. Resource Consumption Inefficiency



There are very low resource consumption inefficiencies in D16 (Manufacture of tobacco products), D30 (For office, calculating, accounting), and D33 (For medical, precision and optical), D37 (Recycling).

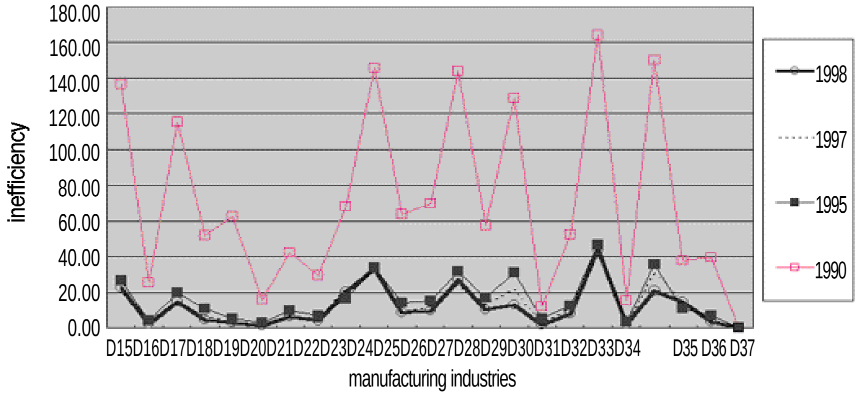
There are very high revenue generating efficiencies in D20 (Wood and products of wood and cork), D30 (For office, calculating, accounting) D33 (For medical, precision and optical), and D37 (Recycling).

The lower the inefficiency, the better the competitiveness. The highest competitiveness receives an inefficiency of zero.

According to Figure 1, there are very low resource consumption inefficiencies in D16 (Manufacture of tobacco products), D30 (For office, calculating, accounting), and D33 (For medical, precision and optical), D37 (Recycling). Furthermore, inefficiency of resource usage in the manufacturing industries have gradually declined over the 1990s.

Also, according to Figure 2, there are very high revenue generating efficiencies in D20 (Wood and products of wood and cork), D30 (For office, calculating, accounting) D33 (For medical, precision and optical), and D37 (Recycling). Similarly, the efficiency of revenue generating activity in manufacturing industries has gradually grown over the 1990s (Figure 2).

Figure 2. Revenue Generating Inefficiency



Consequently, these results indicate that Korean manufacturing industries, despite much competition and the IMF financial crisis, have improved their operational competitiveness to even higher levels just to sustain their efficiency and productivity.

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To achieve higher competitiveness, managing two categories of competitiveness drivers should be considered.

1. Structural drivers are decisions related to "bricks and mortar" and are therefore considered to have long-term implications. Examples of structural decisions are those related to size, capacity, and age of equipment.
2. Infrastructure drivers are decisions related to policies that determine how the "bricks and mortar" are used. Typically, these decisions are under the direct control of the operations managers, and are easier to change. Infrastructure decisions include policies related to equipment, quality, inventory, workforce, new product introductions, product variety and so forth. VIP

Table 3. Operational Competitiveness Rating Analysis

There are currently three broad classes of methods to measure performance, productivity and efficiency: (1) econometric models, (2) nonparametric methods, including data envelopment analysis(DEA) (3) ratios, including index numbers and total factor productivity(TFP) models.

Among these methods, OCRA is affiliated with nonparametric methods using multiple inputs and multiple outputs. This method is essentially an efficiency measurement tool proposed by Prof. Celik Parkan at the Hongkong City University.

At an intuitive level, OCRA computes the inefficiency of individual units relative to a set of other units by taking into consideration all the relevant input-consuming and output-generating activities of the units and assigning to gauge their relative inefficiency in these activites.