

PART 4

MARKET DISTORTIONS

AND TRADE

14. Market Distortions and Polarization of Trade Patterns

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## MARKET DISTORTIONS AND POLARIZATION OF TRADE PATTERNS: KOREAN EXPERIENCE

### 1. INTRODUCTION

In the two-factor, multicommodity trade models of Jones (1971 and 1974), Krueger (1977), and Deardorff (1979), capital accumulation in a small open economy tends to raise the wage rate and the capital intensity and leads to greater increases in the outputs of capital-intensive sectors than in the labor-intensive sectors. In Korea, however, during 1966-83, we observed a fairly rapid expansion of outputs and exports not only in some highly capital-intensive sectors but also in some highly labor-intensive sectors such as footwear and electronics (assembling).

In a simple multicountry model by Deardorff (1979), the expansion of outputs and exports of highly labor-intensive sectors is possible in a country whose degree of factor abundance lies at the intermediate range relative to others, provided that the country excessively protects the highly capital-intensive import-competing sectors. The domestic production of highly capital-intensive commodities behind a high protectionist wall will lower the wage rate and will induce the production of highly labor-intensive commodities in place of the commodities with intermediate capital intensities that are not very different from the country's overall capital-labor endowment ratio. Then these highly labor-intensive commodities become the export goods of the country.

Furthermore, in a Deardorff (1979) type of multicommodity trade model, all importables can be produced domestically, and the necessary level of tariff protection will increase monotonically as the commodities (in terms of their relative capital intensities) lie further away from the country's capital-labor endowment ratio. The export of highly capital-intensive goods, however, is not possible without introducing subsidies.

Krueger (1977, p. 314) has suggested that the policy-cum-structural factor market distortions in the form of lower rental-wage rates applied to the capital-intensive manufacturing sectors would result in expanded production and "exports" of the very capital-intensive commodities that are produced with highly capital-intensive techniques of production. At the same time, the relatively higher rental-wage rates that would result for the labor-intensive manufacturing sectors would make the very labor-intensive sectors become

profitable with highly labor-intensive techniques of production.<sup>1</sup> This implies that, across the countries, we should expect to observe more significant disparities (or polarization) in the capital intensities of sectoral production and exports of a country with substantial factor-market distortions than in those of a country with only moderate distortions in factor markets. In addition, within a country with substantial factor-market distortions, we should expect the disparities to become more conspicuous as time passes.

The object of this chapter is to examine the polarization effect of market distortions by examining the relationship between the distortions in commodity and factor markets and the patterns of manufacturing production and trade in Korea during the period 1960-83.

### COMMODITY AND FACTOR MARKET DISTORTIONS

According to Table 7.1, the effective rate of protection (ERP) on the (moderately capital-intensive) intermediate manufacturing group amounted to about 52 percent, while the rates on both the relatively labor-intensive and the relatively capital-intensive groups of manufacturing sectors amounted to less than 20 percent on the average in 1970. By 1975, however, the ERP on the relatively capital-intensive group of manufacturing sectors amounted to as high as 275 percent, while the ERP on the intermediate group and the relatively labor-intensive group amounted to about -12 percent and -31 percent, respectively. In 1978, the ERP on the relatively capital-intensive group amounted to about 73 percent vis-à-vis 5 percent for the intermediate group and -8 percent for the relatively labor-intensive group. That is, by the late 1970s, the vigorous government policy to promote the capital-intensive "heavy & chemical industries" was reflected in the drastically raised effective rates of protection accorded to these sectors.

<sup>1</sup>In a two-factor two-sector Magee (1976) model, too much subsidy on the use of capital in the capital-intensive sector will raise (the wage rate and) the capital intensities of the capital-intensive as well as the labor-intensive sectors; but will somewhat oddly expand the output of the labor-intensive sector at the given endowment of capital stock. That is, with an extreme capital market distortion, the substitution effect will more than offset the output-expansion effect of the subsidy to the capital-intensive sector. If we further add the labor market distortion in the form of dual labor markets that pay lower wages in the labor-intensive sector, the net output-expansion effect becomes ambiguous, but instead we get a clear substitution effect: the labor-intensive sector becomes more labor intensive and the capital-intensive sector becomes more capital intensive than we would have expected in the absence of such double factor-market distortions.

Table 7.1 Effective Rates of Protection by Sectors: Balassa Method  
(in percent)

Sectors	1970	1975	1978
Labor-Intensive	20.0	-30.5	-8.1
Intermediate	52.0	-12.4	5.1
Capital-Intensive	15.7	274.6	72.5
All-Manufacturing	32.7	-8.0	7.8
Agr. For. & Fishery	30.2	38.9	98.1
Mining	2.9	1.9	33.5

Source: Kim and Hong (1982)

Note: The original 217-sector classification of Kim and Hong (1982) was regrouped into 66 sectors (see Hong, 1988). The labor-intensive manufacturing represents sectors from 1 to 19, the intermediate manufacturing represents sectors from 20 to 36, and the capital-intensive manufacturing represents sectors from 37 to 52.

To see the relationship between the sectoral protection and the capital intensity of each sector, we conducted a simple regression analysis as follows:  $Y = a + bX$  where  $Y_i$  represents the effective rates of protection and  $X_i$  the physical capital intensities of Korean manufacturing sectors in 1978 (where  $i = 1 \dots 52$ ). The results are as shown below:

$$Y = 10.5 + 5.9X \quad R^2 = 0.12$$

(0.55)    (2.35)\*

where the figures in parentheses represent t values and \* represents significance at the 5 percent level. As expected, we found a significant positive relation between the sectoral capital intensities and the sectoral rates of effective protection.

The short-term export credits in Korea have been allocated to exporters in proportion to their gross export earnings, and hence have not discriminated against the manufacturing sectors according to their capital intensities. The export credits, however, take less than 15 percent of total domestic bank loans. The government has rationed, directly or indirectly, most of the remaining domestic bank loans and foreign loans among the selected sectors. In the 1970s, and especially in the late 1970s, the Korean government concentrated its interest-rate-subsidized loan allocations on the loosely defined heavy and chemical industries, which were mostly very capital-intensive industries. See Hong and Park (1986).

Table 7.2 shows that the magnitude of total domestic bank loans expanded

from about 11 percent of GNP in 1954-61 to about 52 percent of GNP in 1980-85. We have approximated the rate of return on capital in Korea by the gross real rate of return on investment in the manufacturing sector. If we take the difference between the estimated rate of return on capital and the weighted-average real interest rate on domestic bank loans to be the subsidy rate associated with credit rationing, the annual provision of interest subsidies in Korea expanded from about 3 percent of GNP in 1962-71 to about 10 percent of GNP, on the average, in 1972-79. At 10 percent of GNP, the domestic credit subsidy must be judged large enough to significantly affect the pattern of Korea's output and trade. Furthermore, the government directly allocated interest subsidies on the foreign loans to entrepreneurs; these averaged about 6 percent of GNP each year in the 1970s.<sup>2</sup>

Table 7.3 shows that in the 1970s (1971-81), the average bank-loan to value-added ratio for the relatively capital-intensive group of manufacturing sectors exceeded that for the relatively labor-intensive group by about 20 to 32 percent. If we include foreign borrowing, however, the average total-loan to value-added ratio for the relatively capital-intensive group of manufacturing sectors was about 170 to 120 percent larger than that for the relatively labor-intensive group. As a result, the average "real" interest cost of total borrowing (that is, the ratio of total financial expenses to total borrowings) of the capital-intensive group of manufacturing sectors amounted to -9.9 percent per annum in 1971-76 and -6.7 percent per annum in 1977-81, while that of the labor-intensive group of manufacturing sectors amounted to -5.6 percent and -1.1 percent, respectively.<sup>3</sup>

<sup>2</sup>The weighted-average real interest rate on foreign loans amounted to 2.1 percent per annum during 1967-71 and -7.4 percent per annum during 1972-76. See Hong and Park (1986). The Eurodollar (LIBOR) interest rates were about 13.2 percent per annum on average during 1977-81, and the domestic currency (won) depreciated by about 7 percent per annum on the average. Meanwhile, the rate of inflation in Korea (approximated by the rate of change in GNP deflator) was about 19.6 per annum on the average during the period. Therefore, the average real interest cost of foreign borrowing to Korean businesses could not have exceeded 1 percent per annum during 1977-81. During 1981-86, the LIBOR rate was 8.6 percent per annum on the average and domestic currency depreciated by about 5.3 percent per annum, while the rate of inflation in Korea was only about 4.2 percent per annum. Therefore, the real interest cost of foreign borrowing amounted to about 10 percent per annum during 1982-86.

<sup>3</sup>Since 1982, however, Korea has been able to keep the rate of inflation below 5 percent per annum (which raised the real rate of interest on domestic bank loans to about 4 percent per annum on the average, and the real interest cost of foreign borrowing to about 10 percent) and has reduced the degree of concentration in credit rationing in favor of capital-intensive industries. As a result, the average bank-loan to

Table 7.3 Sectoral Loan/VA Ratios and Financial Costs

Annual Average	Bank Loans <sup>a</sup>	Total Loans <sup>b</sup>	Fin. Expense <sup>c</sup>
	Value Added	Value Added	Total Borrowing
Labor-Intensive Sectors (1-19)			
1971-76	0.84	0.91	13.98%
1977-81	0.82	0.89	18.53%
1982-86	0.88	0.94	14.38%
Intermediate Sector (20-36)			
1971-76	1.41	1.90	11.65%
1977-81	1.03	1.27	15.69%
1982-86	1.03	1.20	14.30%
Capital-Intensive Sectors (37-52)			
1971-76	1.01	2.46	9.66%
1977-81	1.08	1.97	12.97%
1982-86	0.98	1.45	13.45%

Source: The Bank of Korea, *Financial Statements Analysis*, various issues.

<sup>a</sup>Total short-term and long-term loans from domestic banks divided by value-added.

<sup>b</sup>Domestic bank loans plus foreign loans (excluding trade credits) divided by value-added.

<sup>c</sup>Financial expenses to total borrowings that bear interest payments such as corporate bonds, borrowings from banks and curb markets, etc. It represents the average "nominal" interest cost in percent.

According to the 1978 *Report on Occupational Wage Survey*, the average wage rate of female workers amounted to about 44 percent of the average wage rate of male workers. On the other hand, the wage rate of lowly educated workers (workers with or less than high school education) amounted to about 34 percent of the wage rate of highly educated workers (workers with or more than junior college education). As suggested by the structuralists, sex and education seem to have constituted the two major causes of dual labor markets in Korea.<sup>4</sup>

value-added ratio and total-loan to value-added ratio of the capital-intensive sectors became only 11 percent and 54 percent larger than those of the labor-intensive sectors, respectively, and the average real interest cost of total borrowing of the labor-intensive group exceeded that of the capital-intensive group by only 7 percent per annum on the average during 1982-86.

<sup>4</sup>The wage differentials according to sex and education were significantly reduced by 1985, that is, the wage rate of female workers amounted to 49 percent of that of

In 1978, the proportion of female workers in the total number of workers in the labor-intensive manufacturing sectors amounted to about 55 percent on the average, while that in the capital-intensive sectors amounted to only about 14 percent, on the average. Although we do not have comparable data for the lowly educated workers, it seems that, in Korea, the higher the capital intensity of a manufacturing sector, the smaller is the proportion of female workers and lowly educated workers. These factors must have, at least partly, contributed to the significant positive relationship between the capital intensity and the average wage rate of the sector as shown below (that is, the higher the capital intensity, the higher the sectoral average wage rate):

$$Y = 0.93 + 0.06X \quad R^2 = 0.68$$

(17.76)\*\* (10.19)\*\*

where \*\* represent significance at the 1 percent level. These are the results for 1978, but similar results were obtained for 1983 also.

### SHIFTING PATTERNS OF MANUFACTURING PRODUCTION AND TRADE

#### *Uneven Expansion in the Sectoral Share of Exports and Employment*

During 1966-83, Korea's total commodity exports expanded by about 92 times, growing from \$0.25 billion to \$22.9 billion in current dollar prices; the proportion of manufactures in commodity exports increased from about 82 percent to about 96 percent; manufacturing employment expanded by 3.9 times; the average physical capital intensity (physical capital per worker) of the whole manufacturing sector increased by 3.4 times; and the average real manufacturing wage (applying the GNP deflator) rose by 5.3 times in constant prices. The sectoral share of exports and employment, however, expanded somewhat unevenly.

Among the highly capital-intensive group of manufacturing sectors, the share of fertilizers, chemical fibers, and organic chemicals (Sectors 46, 47, and 48) in total manufactures exports expanded from 0.1 percent in 1966 to 2.9 percent in 1983. Their share in total manufacturing employment also expanded from 0.6 percent to 1.1 percent during the same period. The share of iron and steel (Sector 44) in total manufactures exports expanded from

male workers, and the wage rate of lowly educated workers amounted to 46 percent of that of highly educated workers.

0.04 percent to 3.7 percent, and its share in total manufacturing employment expanded from 0.5 percent to 1.5 percent. Among the moderately capital-intensive group of manufacturing sectors, the share of ships in total manufactures exports expanded from 0.4 percent to 11.0 percent (to about 5 percent excluding the repaired ships), and the share of shipbuilding in total manufacturing employment expanded from 1.4 percent to 3.3 percent.

Among the highly labor-intensive group of manufacturing sectors, the share of artificial wigs in total manufactures exports declined from 7.6 percent in 1966 to 0.25 percent in 1983, and its share in total manufacturing employment also declined from 1.3 percent to 0.3 percent during the same period. The share of both textiles and wearing apparels in total manufactures exports declined slightly during the period (from 7.2 percent to 7.0 percent and from 12.8 percent to 10.1 percent, respectively).

Not surprisingly, in a rapidly growing country like Korea, the share of many labor-intensive sectors in outputs and exports declined—some slowly, some rapidly. One might be surprised, however, to find a rapidly expanding share of highly labor-intensive sectors. Indeed, among the highly labor-intensive sectors, the share of miscellaneous manufactures (excluding artificial wigs) in total manufactures exports expanded from 0.6 percent in 1966 to 5.0 percent in 1983; its share in total manufacturing employment also expanded from 2.4 percent to 3.8 percent during the same period. The share of footwear in total manufactures exports expanded from 3.9 percent to 5.5 percent. The shares of precision instruments and metal products expanded from 0.2 percent to 1.3 percent, and from 1.2 percent to 4.6 percent, respectively. Furthermore, the share of communication equipment, electronic parts, electronic appliances, and semi-conductors and integrated circuits (Sectors 16, 17, 18, and 19) in total manufactures exports expanded from 1.2 percent in 1966 to 13.0 percent in 1983; their share in total manufacturing employment expanded from 0.6 percent to 7.5 percent during the same period.

#### *Increasing Disparities in Capital Intensities of Production and Exports*

The next point for consideration is whether or not the disparities in capital intensities of manufacturing sectors and of manufactured exports became more conspicuous in Korea over the period 1966-83. We have estimated the (standardized) deviations of the sectoral physical-capital intensities from the manufacturing mean value by computing  $\zeta_i^* = (k_i / \bar{k}) - 1$  [where  $k_i = K_i / N_i$ ,  $\bar{k} = K / N$ , and  $K$  and  $N$  represent total physical capital and total number of workers in manufacturing, respectively], and then multiplying each of them



with the share of exports ( $x_i$  or  $\bar{x}_i$ ) or employment ( $n_i$ ) of each sector in total manufactured exports or in total manufacturing employment. And then two dispersion indices (DI) were computed by summing up (i) the numbers with negative values only, and (ii) the number with positive values only. We also have estimated the positive and negative DI using the value added per worker ( $c_i$ ) as an index of the total capital intensity of each sector. The shares of sectoral exports were estimated by using the gross export values ( $x_i$ ) presented in the I-O Tables as well as the net values ( $\bar{x}_i$ ). The net export figures were estimated by applying the sectoral value-added coefficients (where the sectoral value-added coefficient and induced import coefficient add up to unity) computed from the I-O data.

Table 7.4 Dispersion Indices (DI) of Capital Intensities for Manufactured Exports and Manufacturing Employment in Korea, 1966 and 1983

Weighted Relative Share of Sectoral- -	Physical Capital Intensities ( $k_i^*$ )		Total Capital Intensities ( $c_i^*$ )	
	1966	1983	1966	1983
- - Gross Exports	$\sum k_i x_i$		$\sum c_i x_i$	
Negative DI	-0.27	-0.33	-0.29	-0.23
Positive DI (1)	0.52	1.05	0.60	0.96
(Tobacco Products)	(0.05)	(0.00)	(0.12)	(0.01)
(Cement)	(0.13)	(0.07)	(0.07)	(0.02)
(Refined Petroleum)	(0.23)	(0.39)	(0.33)	(0.71)
Positive DI (2)	0.11	0.59	0.08	0.22
- - Net Exports	$k_i^* \bar{x}_i$		$c_i^* \bar{x}_i$	
Negative DI	-0.29	-0.35	-0.31	-0.25
Positive DI (1)	0.53	0.76	0.62	0.48
(Tobacco Products)	(0.07)	(0.00)	(0.17)	(0.01)
(Cement)	(0.16)	(0.08)	(0.08)	(0.03)
(Refined Petroleum)	(0.20)	(0.12)	(0.29)	(0.22)
Positive DI (2)	0.10	0.56	0.08	0.22
- - Employment	$\sum k_i n_i$		$\sum c_i n_i$	
Negative DI	-0.20	-0.34	-0.24	-0.26
Positive DI	0.20	0.34	0.24	0.26

When we apply physical-capital intensities, we can see that the negative DI and the positive DI of Korea's (gross or net) manufactured exports and

employment have all increased significantly during 1966-83. Interestingly, however, the results presented in Table 7.4 do not show any significant increases in the disparities of capital intensities during 1966-83 when we apply the per worker sectoral value added (as an index of total capital intensity of each sector). Such a result may be attributed to the fact that the distortions in Korea's factor market have been very concentrated on the use of physical capital only and consequently have generated increasing disparities mostly in the physical-capital intensities of manufactures exports and manufacturing employment.

Table 7.4 shows that manufactured tobacco products, cement, and particularly the refined petroleum products contributed most significantly to enhance the magnitude of positive DI of manufactures exports in 1966 as well as in 1983. However, the I-O export data and the export data based on customs clearance differed enormously in 1966. The differences represent the military procurements by the UN Command that were recorded as exports in the I-O Tables. For instance, the cigarettes purchased by the UN Command (with U. S. funding) were consumed almost entirely by the Korean soldiers under the UN Command (or in Vietnam), and yet, since they generated foreign-exchange earnings to the Korean government, they were recorded as exports. The same is true with fuel oils. On the other hand, the I-O export data and the customs clearance data differed only slightly in 1983, since the UN Command no longer made such procurements. That is, in 1966, the so-called exports of tobacco products, cement, and refined petroleum represented mostly domestic consumption while those in 1983 represented real exports. The positive DI excluding these three items [that is, positive DI (2) in Table 7.4] show more than doubling disparities in capital intensities during 1966-83.

When we apply the "total" capital intensities,  $c$ , to the gross export values, the negative DI declines in absolute magnitude. Furthermore, the DI for manufacturing employment shows a very small increase during 1966-83. When we apply total capital intensities to the "net" export values, both positive and negative DI decrease significantly. The positive DI increases significantly if we take out tobacco, cement, and petroleum products, but we still have the declining negative DI. Therefore, we can conclude that during 1966-83 only the disparities of "physical" capital intensities increased substantially. We cannot be so sure about the general trends of shift for "total" capital intensities.

#### *Differential Rates of Sectoral Capital Deepening*

If we examine Table 7.5, we can see that the real wage rate increased by

10 percent per annum on the average during 1966-83 in Korean manufacturing sectors. However, the physical-capital intensity of the relatively labor-intensive manufacturing sectors increased by only about 5 percent per annum on the average during the period, while that of relatively capital-intensive sectors increased by about 11 percent per annum. The estimated point elasticity of substitution (assuming no change in rental price of capital) between 1966 and 1983 amounted to about 0.5 in labor-intensive sectors while that in capital-intensive sectors amounted to about 1.2. Such difference may at least partly be explained by the differences in total-loan/value-added ratios (0.9 versus 2.1) and in real interest costs (-1.6 percent versus -5.8 percent). That is, the fact that the capital-intensive manufacturing sectors were provided with more than twice larger (domestic bank and foreign) loans per value added activity at more than three times cheaper (overall) financial costs must be responsible for such a differential in the rates of capital deepening between labor-intensive sectors and capital-intensive sectors.

An interesting fact is that when we used the per worker value added as an index of total capital intensity, we could not observe very significant differences between the labor-intensive sectors and capital-intensive sectors. The per worker value added of both groups of sectors increased by about 10 percent per annum during 1966-83. The elasticity of substitution estimated by using per worker value added amounted to about 1.0 for the labor-intensive sectors and about 1.1 for the capital-intensive sectors. It seems that there has been significant deepening of non-physical-capital intensities, say, in the form of skill and other human capital formation, in the labor-intensive group of manufacturing sectors. On the other hand, since the capital-intensive sectors were provided with relatively abundant funds for physical-capital formation at low financial costs, they seem to have paid less attention on the non-physical-capital formation activities.

#### CONCLUDING REMARKS

We observed that, in the 1970s, the Korean economy maintained significant distortions in commodity and factor markets in favor of the capital-intensive manufacturing sectors. Capital accumulation is expected to raise both the wage rate and the capital intensity of the production processes of the manufacturing sectors in general, and at the same time it is expected to expand the output and the employment of capital-intensive sectors more rapidly than those of the labor-intensive sectors (see Hong, 1975, 1976, 1979, 1987). Commodity and capital market distortions in favor of the capital-

intensive sectors should accelerate the speed of capital deepening and the speed of the expansion of the capital-intensive manufacturing sectors. In Korea the real wage rate increased by about 10 percent per annum, on the average, during 1966-83 in both labor-intensive and capital-intensive sectors. And yet, the physical-capital intensity of capital-intensive sectors increased at more than twice the rate of the labor-intensive sectors. Such a difference may be partly explained by the credit rationing and interest cost differentials in favor of capital-intensive manufacturing sectors.

On the other hand, we also observed fairly rapid rates of expansion in the output and exports of some highly labor-intensive sectors such as wearing apparel and electronics and telecommunications equipment. These sectors, however, showed very low rates of capital deepening during the 1966-83 period. That is, we could observe increasing disparities in the physical-capital intensities of manufacturing sectors and of manufactured exports in Korea. This polarization phenomenon is consistent not only with the commodity market distortions but also with the double-factor-market-distortion model, that is, relatively low wage rates paid in the labor-intensive sectors together with a subsidized credit rationing in favor of the capital-intensive sectors. We observed that in Korea the higher the capital intensity of a sector, the higher the sectoral average wage rate was. Furthermore, we observed a significant positive relation between the capital intensity of a sector and the rate of effective protection accorded to the sector.

One may contend that the increased polarization of Korea's export pattern must be, at least partly, explained by the "protection" of Korea's established export markets for labor-intensive commodities by the established quota system of advanced countries that discriminates against the "later comers" (such as China) that have even lower wage cost than Korea. One may also contend that the rapid expansion of some labor-intensive manufactures exports does represent the growing diversification of Korea's exports into the high-quality, skill-intensive commodities instead of an increasing polarization in terms of capital-intensive commodities vs. simple unskilled labor-intensive commodities.

We could not determine to what extent the higher real wage rates in capital-intensive sectors reflected the return on human capital (such as higher education and higher on-the-job skill training). Furthermore, we only examined the factor market distortions in Korea and made no attempt to examine whether Korea's factor markets were more or less distorted in comparison with its major competing countries such as Taiwan. Perhaps one may argue that Korea's labor market has operated efficiently on the basis of supply and demand and has not been any more dualistic than the labor

markets of Taiwan. One may, however, still argue that Korea's capital market has been more distorted in favor of capital-intensive sectors than that of Taiwan, and that a more amplified Krueger mechanism has operated in Korea, polarizing its export pattern more than in Taiwan. Unless one can substantiate the merit of polarized growth, however, we should expect that the reduction in market distortions would enhance the allocative efficiency of the Korean economy.

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