

PART 3

MARKET DISTORTIONS

AND TRADE

10. Skill Intensity of Trade: the Case of Korea, 1962-71

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SKILL INTENSITY OF TRADE: THE CASE OF KOREA, 1962-71

I. INTRODUCTION

ALTERING THE TWO-FACTOR Heckscher-Ohlin model to incorporate natural resources and labor skills, D. Keesing assumes the differences in mobility of factors of production, i.e., natural resources are immobile, capital moves internationally at a low cost, and labor of whatever kind moves at high cost. Economic activities can then be divided into primary activities, those that must be located around the natural resources which they require as direct inputs, and secondary activities, which may be freely located away from natural resources. Since the indirect natural resource requirements of secondary activities can be imported in processed form, these industries will be located according to the availability of skilled and unskilled labor and capital. Because movement of capital to labor is cheaper than the reverse, Keesing hypothesizes that the chief influence on location will be skill endowments [4].

Training can reshape the specific skills of a labor force in a short period of time, but only within narrow limits dictated by the cultural and educational background of the population involved, the availability of skilled people to give training, and economic opportunities for on-the-job training. Some occupational skills can be acquired only through a long process of professional training. The general training and experience of a population, together with its attitudes and working habits, resist rapid change. Therefore, broad classes of skills in any population can only be altered slowly. The postulation that the endowments of labor skills are among the major determinants of comparative advantage implies that there can be a skill bottleneck present in the expansion of industrial production. A country will not be able to expand its production of more skill-intensive products until it acquires a large skill endowment through training and other investments in human capital.

Using the sectoral skill coefficients of the United States derived from Leontief's skill calculations, Keesing measured the "direct" skill content of exports and imports for the United States, seven European countries, and Japan, and showed that those whose exports are more skill-intensive have

higher per capita income and less skill-intensive imports. From this study Keesing concluded the skill availability is a major factor in the determination of trade patterns, and that the United States has abundant skilled labor and hence tends to export skill-intensive goods and import unskilled-labor-intensive goods [3] [4].

This paper investigates the skill intensity of Korea's trade and its changing pattern during 1962-71. The direct plus indirect skill requirements for export and import replacements were computed applying the Leontief method [5] [6, pp. 386-407]. Due to the limited data availability the 1968 input-output table (forty-three sector classification) and 1970-71 skill input coefficients were used for the entire 1962-71 period.

I find that export production requires more unskilled labor and less skilled labor than import replacements, which is consistent with the implicit hypothesis that Korea is a skill-scarce country and hence has comparative advantage in relatively unskilled-labor-intensive goods. However, when skill requirements were computed for the entire 1962-71 period, there was virtually no change in skill composition of labor required for either export production or import replacements. Its implication is examined at the end of the paper.

II. STATISTICAL DATA

In order to assume a causal connection flowing from the skill endowments to the trade pattern, and also considering the limited availability of data on labor skills, it was first decided to divide the labor force of each industry into five occupational skill groups: (I) engineers and scientists, (II) technicians, (III) clerical workers, (IV) skilled workers, and (V) semi-skilled and other workers. Total labor coefficients were first disaggregated into the above five different categories, and then, by using the input-output table of forty-three sector classification, the direct and indirect requirements for each skill group were computed.

On the other hand, it may be argued that differences in average monthly wages paid to various occupations would reflect differences in the amount of skill-training and education required by those occupations. On the assumption that differences in monthly labor earnings are due mainly to differences in skill (or more broadly, in human capital embedded in workers), the sectoral labor requirements may be disaggregated according to wage classes in order to get what might be a more reliable index of skill content, and then one may examine the skill intensity of trade. Hence the labor classes were grouped in the following fashion: (I) less than 10,000 won per

month—unskilled; (II) 10,000-19,999 won per month—semi-skilled; (III) 20,000-49,999 won per month—skilled; and (IV) more than 50,000 won per month—highly skilled.

For the former classification of occupational skill groups, the 1970 OLA (Office of Labor Affairs) survey results on “actual labor conditions at establishments employing 10 or more workers” were used [7]. For the latter classification of wage groups, the 1971 OLA sample observation of 2,014 establishments employing ten or more workers were used [8]. Since both data exclude establishments with less than ten workers, both have a kind of built-in bias in their estimation of skill composition. For instance, agricultural and service sectors tend to show an unduly high rate of skilled labor employment.

After all, the total number of workers included in the former survey data was 1,084, 100, but only 4,100 were agriculture and forestry workers and 692,600 were in mining and manufacturing. Therefore, it may be said that the mining and manufacturing sectors were best represented, the service sectors were reasonably well represented, but agriculture and forestry sectors were very badly represented in the survey. For instance, 52.3 per cent of workers in agriculture and 90.9 per cent of workers in forestry were classified as clerical workers. Hence it is obvious that the 1970 survey data on establishments employing ten or more workers cannot be used to compute the skill composition of the agriculture and forestry sectors.

According to these 1970 survey data, the total number of workers in “agricultural and forestry establishments employing ten or more workers” was only 4,139 and, of those, there were 96 engineers, 184 technicians, and 2,248 clerical workers. If we divide these figures by the total number of labor in the whole agriculture and forestry sector in 1970 (4,745,000), the results are 0.002 per cent, 0.004 per cent, and 0.05 per cent. Since no significant number of engineers, technicians, and clerical workers are expected to exist in agricultural and forestry establishments employing less than ten persons, half of the agricultural and forestry workers were classified as skilled and the other half as semi-skilled or unskilled. Similarly, half were put in the lowest wage group (0-9,999 won) and the other half in the second lowest wage group (10,000-19,999 won). Since non-commodity trade as well as imports of natural-resource-intensive goods such as rice, wheat, and wood were excluded from skill intensity computation by classifying them as non-competitive imports, the result may not give an extremely distorted picture.¹

¹The Bank of Korea's definition of competitive and non-competitive imports is

TABLE I
 DIRECT AND INDIRECT SKILL REQUIREMENTS FOR COMMODITY EXPORTS
 (Classification by Occupational Skill Group)
 1,000 persons & %: I-0 43 sector classification

	I Engineer & Scientist	I Technician	III Clerical	IV Skilled	V Semi-Skilled & Others	Total Labor
1962	0.7 (0.6)	1.9 (1.7)	7.8 (6.8)	42.3 (36.6)	63.0 (54.3)	115.6
1963	1.1 (0.8)	3.0 (2.3)	13.9 (10.5)	42.5 (31.9)	72.7 (54.5)	133.1
1964	1.3 (0.7)	3.8 (2.2)	18.1 (10.3)	56.7 (32.3)	95.7 (54.5)	175.5
1965	1.8 (0.8)	5.4 (2.3)	26.6 (11.3)	72.8 (30.9)	129.2 (54.7)	235.9
1966	2.2 (0.6)	7.0 (2.0)	36.2 (10.5)	112.6 (32.7)	186.6 (54.2)	344.6
1967	2.7 (0.7)	8.9 (2.2)	46.6 (11.5)	125.5 (31.0)	221.6 (54.6)	405.4
1968	3.4 (0.7)	10.9 (2.1)	61.6 (11.6)	168.5 (31.8)	285.9 (53.8)	530.4
1969	4.5 (0.7)	13.8 (2.0)	83.1 (12.0)	222.3 (32.0)	370.5 (53.3)	694.2
1970	5.6 (0.7)	17.7 (2.0)	107.2 (12.3)	372.5 (31.3)	468.5 (53.7)	871.6
1971	6.6 (0.6)	20.6 (2.0)	128.6 (12.5)	327.7 (31.7)	549.1 (53.2)	1,032.8

Sources: [7] [2].

III. STATISTICAL RESULTS

Tables I and II show that about 3 per cent of total labor directly and indirectly required for export production in 1968 were engineers and technicians, about 32 per cent skilled workers, about 54 per cent unskilled workers, and the remaining 11 per cent clerical workers. On the other hand, about 4 per cent of total labor directly and indirectly required to replace competitive imports in 1968 were the engineers and technicians, about 28 per

used with the exception of two items, rice and wheat. The Bank of Korea itself defines rice and wheat as competitive imports. However, taking account of the fact that Korea's population density ranks the fourth in the world, and that there have been large increases in imports of rice and wheat with virtually no increase in their production or acreage under cultivation during the 1962-71 period, it does not seem likely that their imports will be replaced by use of labor whose magnitude approximated by the sectoral labor-output ratios in 1968. After some reflection, rice and wheat were added to the list of non-competitive imports. As a result, in 1968 for instance, 50 per cent of commodity imports were excluded from skill requirements computation as non-competitive imports [1, pp. 105-16]. For more detailed discussions on statistical data, see [2].

TABLE II
 DIRECT AND INDIRECT SKILL REQUIREMENTS FOR COMMODITY IMPORTS
 (Classification by Occupational Skill Group)
 1,000 persons & %: I-0 43 sector classification

	I Engineer & Scientist	I Technician	III Clerical	IV Skilled	V Semi-Skilled & Others	Total Labor
1962	3.0 (1.1)	6.4 (2.3)	38.9 (14.2)	86.0 (31.5)	139.1 (50.9)	273.4
1963	4.0 (1.1)	8.8 (2.3)	51.8 (13.7)	120.8 (32.0)	192.5 (50.9)	378.0
1964	2.7 (1.0)	5.8 (2.2)	34.2 (12.7)	90.0 (33.4)	136.3 (50.7)	268.7
1965	3.3 (1.2)	7.2 (2.7)	41.5 (15.7)	78.5 (29.6)	134.9 (50.8)	265.4
1966	6.0 (1.4)	13.3 (3.1)	75.5 (17.7)	115.2 (27.0)	216.9 (50.8)	427.0
1967	8.0 (1.5)	17.9 (3.2)	101.4 (18.3)	145.0 (26.2)	280.5 (50.7)	553.0
1968	11.0 (1.3)	25.0 (3.0)	139.5 (16.6)	238.5 (28.3)	428.8 (50.8)	842.9
1969	11.9 (1.3)	26.9 (2.8)	152.7 (16.0)	274.8 (28.8)	486.3 (51.0)	952.7
1970	12.0 (1.3)	26.9 (2.8)	152.8 (15.9)	277.5 (28.9)	491.3 (51.2)	960.6
1971	12.3 (1.1)	28.0 (2.6)	159.0 (14.6)	331.0 (30.4)	558.0 (51.3)	1,088.5

Sources: [7] [2].

Note: Entire non-competitive imports (defined by the Bank of Korea) as well as rice and wheat were excluded from skill requirements computation.

TABLE III
 DIRECT AND INDIRECT SKILL REQUIREMENTS FOR COMMODITY EXPORTS
 (Classification by Wage Group)
 1,000 persons & %: I-0 43 sector classification

	I Highly Skilled (50,000 Won and Over)	II Skilled (20,000- 49,999 Won)	III Semi-Skilled (10,000- 19,990 Won)	IV Unskilled (Less Than 10,000 Won)	Total
1962	3.0 (2.6)	17.0 (14.7)	52.0 (45.0)	43.6 (37.7)	115.6
1963	5.2 (3.9)	28.4 (21.3)	55.9 (42.0)	43.5 (32.8)	133.1
1964	6.6 (3.8)	35.5 (20.2)	73.9 (42.1)	59.5 (33.9)	175.5
1965	9.8 (4.2)	51.6 (21.9)	97.3 (41.3)	77.1 (32.6)	235.9
1966	13.0 (3.8)	67.1 (19.5)	144.4 (41.9)	120.2 (34.8)	344.6
1967	16.6 (4.1)	85.1 (21.0)	165.9 (40.9)	137.8 (34.0)	405.4
1968	21.6 (4.1)	109.1 (20.6)	215.4 (40.6)	184.3 (34.7)	530.4
1969	29.0 (4.2)	143.7 (20.7)	279.1 (40.2)	242.4 (34.9)	694.2
1970	37.7 (4.3)	185.4 (21.3)	348.2 (40.0)	300.3 (34.4)	871.6
1971	45.1 (4.4)	220.5 (21.4)	409.2 (39.6)	357.9 (34.6)	1,032.8

Sources: [8] [2].

TABLE IV
 DIRECT AND INDIRECT SKILL REQUIREMENTS FOR COMMODITY IMPORTS
 (Classification by Wage Group)
 1,000 persons & %: I-0 43 sector classification

	I Highly Skilled (50,000 Won and Over)	II Skilled (20,000- 49,999 Won)	III Semi-Skilled (10,000- 19,990 Won)	IV Unskilled (Less Than 10,000 Won)	Total
1962	15.1 (5.5)	71.0 (26.0)	104.5 (38.2)	82.7 (30.3)	273.4
1963	19.8 (5.2)	95.9 (25.4)	146.8 (38.9)	115.4 (30.5)	378.0
1964	13.2 (4.9)	62.4 (23.2)	106.0 (39.5)	87.1 (32.4)	268.7
1965	15.9 (6.0)	75.6 (28.5)	98.3 (37.0)	75.7 (28.5)	265.4
1966	28.5 (6.7)	139.3 (32.6)	151.0 (35.4)	108.2 (25.3)	427.0
1967	37.6 (6.8)	184.7 (33.4)	193.3 (35.0)	137.3 (24.8)	553.0
1968	50.6 (6.0)	255.9 (30.4)	308.5 (36.6)	227.8 (27.0)	842.9
1969	55.4 (5.8)	277.9 (29.2)	353.5 (37.1)	265.8 (27.9)	952.7
1970	56.0 (5.8)	281.0 (29.3)	356.1 (37.1)	267.4 (27.8)	960.6
1971	58.2 (5.4)	292.3 (26.9)	415.2 (38.1)	322.6 (29.6)	1,088.5

Sources: [8] [2].

Note: Entire non-competitive imports (defined by the Bank of Korea) as well as rice and wheat were excluded from skill requirements computation.

cent skilled workers, about 51 per cent unskilled workers, and the remaining 17 per cent clerical workers. Hence export production clearly required a little bit more unskilled labor and a little bit less engineers and technicians than import replacement.

Tables III and IV show that about 4 per cent of total labor required for export production in 1968 belong to the highly skilled labor group (a monthly wage of 50,000 won and over), about 21 per cent to the skilled labor group (those with a monthly wage of 20,000-49,999 won), and about 35 per cent to the unskilled labor group (a monthly wage of less than 10,000 won). On the other hand, about 6 per cent of total labor required to replace competitive imports in 1968 belong to the highly skilled labor group, about 30 per cent to skilled labor, and about 27 per cent to the unskilled labor. Hence it is again evident that export production requires more unskilled and less skilled labor than import replacements. The difference between the skill intensity of exports and imports is more pronounced when the skill group is classified on the basis of monthly wage rates than when it is classified by occupation, i.e., engineer, technician, clerical, skilled, etc.

Although the entire non-competitive imports are excluded from skill intensity computation, since most excluded items are likely to be very skill intensive, we can conclude that our statistical result is consistent with the implicit hypothesis that Korea is skill-scarce country and hence has comparative advantage in relatively unskilled-labor-intensive goods.

TABLE V
OCCUPATIONAL DISTRIBUTION OF EDUCATED PERSONS: 1960 and 1970

	Total		Years of Education (%)			
	Persons	%	0	1-6	7-12	13 & Over
1960:						
Population (15 & over)	14,830,528 ^a		43.7	36.1	17.4	2.6
Employed persons	7,027,915 ^b	(100)	44.5	39.4	13.4	2.4
1. Professional & technical	165,755	(3)	3.2	9.3	53.9	33.5
2. Clerical	182,625	(3)	1.3	20.8	58.0	19.8
3. Administrative	89,825	(2)	14.8	36.9	37.0	11.4
4. Service	413,960	(6)	22.9	47.3	25.7	3.9
5. Sales	577,150	(9)	33.5	44.0	19.9	2.4
6. Production-process	885,000	(13)	26.1	53.9	18.8	1.1
7. Agriculture & mining	4,654,010	(67)	55.3	37.2	6.8	0.5
1970:						
Population (15 & over)	18,193,819 ^c		24.4	39.2	30.8	5.8
Employed persons	10,152,948 ^d	(100)	23.8	43.7	26.5	6.2
1. Professional & technical	322,772	(4)	1.3	5.5	37.7	55.6
2. Clerical	593,475	(6)	0.4	9.3	58.8	31.6
3. Administrative	95,799	(1)	1.3	14.1	44.9	39.9
4. Service	678,616	(7)	10.0	50.7	35.6	3.9
5. Sales	1,028,090	(11)	13.3	39.6	40.0	7.3
6. Production-process	2,197,775	(22)	9.0	48.1	40.0	3.0
7. Agriculture & mining	5,147,955	(51)	38.9	49.1	11.5	0.6

Sources: Economic Planning Board, *1960 Population and Housing Census of Korea: 20% Sample Tabulation Report* and *1970 Population and Housing Census Report: 10% Sample Survey*.

^a Includes 72,329 unknown persons.

^b Includes 86,775 unknown and unclassifiable persons.

^c Includes 736 unknown persons.

^d Includes 91,031 unknown and unclassifiable persons.

However, when such skill requirements were computed for the entire 1962-71 period, there was virtually no change in the skill composition of

labor required for either export production or import replacements. A former study [2] shows that not only was there significant capital accumulation in Korea during 1962-71, but there was also a significant increase in capital intensity of Korea's exports and a decrease in capital intensity of competitive imports. Since the same set of data were applied for this study, one immediate implication deduced is that there seems to be no close correlation between sectoral capital intensity and sectoral skill intensity. Another implication is that there has been either no significant accumulation of skill during 1962-71 or that there has been significant skill accumulation but, as far as production costs are concerned, they were not significant enough to change the comparative advantage of Korea toward skill-intensive sectors. The latter implication may also be interpreted to be that the skill factor itself is not very important in production processes, at least, as far as the kind of commodities exported from and competitively imported to Korea during the 1962-71 period are concerned.

Table V shows that there have been significant increases in the supply of educated labor during 1960-71, and there have been increases in the labor in occupations which use a large number of relatively highly educated persons. However, the overall impression is that the general level of education was significantly improved in every occupational group. Therefore, if there were significant increases in general education and informal training, they must have spread fairly evenly over each skill group, and hence could not specifically influence the direction of changes in comparative advantage towards relatively skill-intensive sectors.

Since there is little confidence in the basic skill data, no further speculations can be made on possible implications. However, since it is generally believed that skill supply will play a decisive role for Korea's export expansion in the seventies, one may indicate a desirability for a more rigorous investigation in this area.

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