Korea: Tomorrow's Japan?

Mitchell H. Kellman*
and
Yuosang Yun**

I. Background

The economic development of the Republic of Korea — usually referred to as South Korea, and here simply as Korea — is often, and rightly, compared with the Japanese experience. The similarities between the two Far Eastern neighbors are indeed compelling: the two countries entered the post-war era with war-torn economies which had very few natural resources except for labor; both countries received significant economic assistance from the United States, which also acted as the guarantor of their security; both countries enjoyed windfall benefits from the war efforts of the U.S. — the Korean War in the case of Japan, and the Indo-China war for Korea; both countries chose export-led growth as the vehicle of their economic development, and both succeeded remarkably well.

The roots of similarities between the countries go back to well before the Second World War. By the time of Korean independence in 1946, it had experienced forty years of direct colonial rule under Japan and centuries of influence originating from geographic proximities and shared cultural roots. From the fostering of zaibatsa-like giant trade based conglomerates (called jaebal) to production and marketing techniques, Korean export promotion has been consciously modeled after the Japanese export success. One needs only to glance at the long-term economic plans

* Associate Professor, The City College of Cuny.
** Data Resources, Inc.

of Korea (for example, Korea Development Institute's Long-Term Prospects for Economic and Social Development, 1977-91) to see the importance of the Japanese model in guiding the Korean strategy. The current emphasis on heavy industry development in Korea (especially steel, nonferrous metals, chemicals, and shipbuilding) can be traded to the Japanese experience in the 1960s and early 1970s when the growth of those industries was seen as the key to transforming a labor intensive light manufactured exports sector into a capital intensive and high value-added one.

The similarities between the two countries are indeed compelling in the area of international trade, and specifically in the area of export expansion. Both Japan and Korea have literally "exploded" into the world market for manufactures — Japan since the 1960s, and Korea especially during the 1970s. Both countries have helped their respective spectacular successes in the area with domestic policies explicitly designed to promote exports by first allocating scarce capital to the export sector on favorable (low interest) terms, and later by maintaining an economic environment which tended to maintain export profitability (i.e., avoidance of overvalued currency).

It has been suggested that Korea's export success is not only patterned after Japan's, but that indeed Korea is the Japan of a decade ago. In terms of the "product cycle" theory, Korea is typically viewed as "stepping on Japan's heels," having tended to displace Japan from labor-intensive industries in the past and moving in the direction of displacing Japan's trade position in industries characterized by higher and higher levels of skill and sophistication (even as Japan does likewise to the United States at the more sophisticated end of the spectrum of the product cycle).

This section will analyze the comparable export growth patterns of Korea and Japan, in particular addressing how closely the Korean export pattern resembles that of the Japanese, and how rapidly Korea has been "catching up." The methodology used can be divided into three parts. First, exports are disaggregated according to their destinations and particular attention is paid to market shares and changes in market shares for different geographic markets. Second, exports are categorized into various sectors, and changing market share patterns for each sector are studied. Lastly, exports are analyzed in terms of their "characteristics."

II. Korea and Japan Exports — Similarities and Differences

As background to the following discussion, it is helpful to understand the sizes or the trade flows of each of these countries. The following table indicates the dollar values of all exports of each of the two countries for 1965, 1970, 1975, and 1979.

Table 1

VALUE OF TOTAL EXPORTS (NIA BASE)

	1965	1970	1975	1979
Japan				
Total (Mil. U.S.$)	9,873	23,132	66,374	116,208
Per Capita (U.S.$)	100	222	595	1,003
Korea				
Total (Mil. U.S.$)	253	1,206	5,679	18,361
Per Capita (U.S.$)	9	37	161	488
Japan/Korea Ratio				
Total	39.0	19.2	11.7	6.3
Per Capita	11.1	6.0	3.7	2.1

From Table 1 above, it is clear that both countries enjoyed an extraordinary growth in exports since 1965. Korea's export growth tended to clearly outstrip Japan's. For the sake of perspective, though, it must be borne in mind that Japan's exports are clearly much larger than those of Korea's, so that while Korea's growth rate was higher, the absolute value of the increments to its exports never came close to that of Japan. Nevertheless, Korea was clearly closing the gap. Thus, in 1965, the value of Japan's manufactured exports exceeded Korea's by more than seventy fold. By 1970, the ratio was reduced to a factor of thirty. In 1975, Japan's manufactured exports were only 12.7 times those of Korea's. This trend continued into the late 1970s, so that by 1978, Japan's manufactured exports were only roughly 9 times larger than Korea's.

In per-capita terms, the degree to which Korea had been catching up to Japan is even more dramatic. By the late 1970s, manufactured exports per person in Japan were only three times

higher than those of Korea's.

Another way to focus on the unusual expansionary experience of each country is to explicitly note the average annual growth rates of their respective exports. This is done in Table 2.

Table 2

AVERAGE ANNUAL EXPORT GROWTH RATES (IN REAL $)
JAPAN, KOREA, AND ALL OECD 1965-1977

Markets/Exporter	Japan	Korea	All OECD
World	15.1	36.9	10.4
Developed Market Economies	14.9	37.8	9.8
-(U.S.A.)	13.5	33.6	10.4
Developing Countries	13.5	34.7	8.7
OPEC	23.3	77.9	18.8

Again, a picture of remarkable growth is revealed. While world manufactured exports (or, more correctly, those of the industrialized market economies) grew at a real annual rate of 10.4%, Japan's exports grew 50% faster than the world average. Korea's annual growth rate was truly remarkable, over twice that of Japan's, and over three times that of the world's average. The results are almost identical if we examine the interval 1970-78 (15.2% for Japan, 33.2% for Korea, and 10.4% for all OECD).

Thus, both countries had a similar experience in terms of significantly expanding their export shares in the world markets. They differed in that Korea's export growth significantly outstripped that of Japan.

Were the respective growth experiences similar in individual markets? Again, the answer is clear in Table 2. In all but one significant market, the growth differential was fairly constant — the one exception being the OPEC market. For both countries, the growth of exports to the MDCs (modern industrialized market economies) tended to exceed that to the developing countries (LDCs). For both, the growth in exports to the United States tended to lag that to other MDCs. In each of these markets, Korea's growth experience was roughly 2½ times that of Japan's. Only in OPEC did the growth in Korea's exports exceed that of Japan by over 50 percentage points.

III. Market Compositions

Were there significant differences in the destination composition of the exports of the two countries, and did such differences tend to grow or disappear over the past two decades? The answer is in Table 3. Table 3a depicts the market distribution of all manufactured exports for both countries. Table 3b does the same for each major product category.

An examination of Table 3 reveals the following: in 1965, Japan's exports were almost evenly distributed between the industrialized MDCs (49.5%), and the (then) relatively poor LDCs (including OPEC). The picture in 1977 was roughly unchanged, where the respective split was 47.9% and 45.9% (though the distribution between exports to LDC and OPEC had shifted in favor of the latter).

The picture for Korea is quite different. Its dependence on MDC markets was more marked, and this remained true through-

Table 3A

EXPORTS BY DESTINATION – ALL EXPORTS

JAPAN'S EXPORTS BY DESTINATION

	1965	1970	1975	1977
Modern Developed Countries	49.5	55.0	42.2	47.9
-United States	29.8	31.7	20.2	25.0
Developing Countries	43.9	38.4	49.1	45.9
OPEC Countries	7.0	5.3	15.5	15.1
Planned Command Economies	6.7	6.6	8.6	6.2
TOTAL (%)	100.0	100.0	100.0	100.0

KOREA'S EXPORTS BY DESTINATION

	1965	1970	1975	1978
Modern Developed Countries	68.7	87.4	80.5	74.3
-United States	47.0	58.7	35.3	34.6
Developing Countries	31.2	12.6	19.4	25.5
OPEC Countries	0.4	1.8	5.1	10.7
Planned Command Economies	0.1	0.0	0.1	0.0
TOTAL (%)	100.0	100.0	100.0	100.0

Table 3B

DISTRIBUTION OF PRODUCT – CATEGORIES BY MARKETS

JAPAN 1965

	MDC	(USA)	LDC	(OPEC)	WORLD
Textiles	41.6	20.0	40.9	13.1	100.0
Clothing	71.8	54.2	19.9	6.4	100.0
Wood and Paper Products	63.1	44.0	27.2	5.0	100.0
Miscellaneous Manufacture	77.9	47.9	17.3	3.0	100.0
Non-Metallic Minerals	64.7	43.5	24.9	8.7	100.0
Rubber Products	22.3	8.8	37.2	30.8	100.0
Basic Metals	56.4	40.4	30.7	6.2	100.0
Chemicals	29.3	8.5	42.9	4.3	100.0
Machinery	45.8	29.6	39.9	5.9	100.0
Transportation Equipment	33.9	12.8	56.1	5.4	100.0

KOREA 1965

	MDC	(USA)	LDC	(OPEC)	WORLD
Textiles	54.4	27.5	45.6	1.5	100.0
Clothing	97.0	66.4	3.0	0.0	100.0
Wood and Paper Products	98.7	92.5	0.8	0.0	100.0
Miscellaneous Manufacture	90.0	75.1	10.0	0.1	100.0
Non-Metallic Minerals	18.8	12.8	81.2	0.1	100.0
Rubber Products	9.8	7.2	90.2	3.1	100.0
Basic Metals	24.7	3.2	75.3	0.0	100.0
Chemicals	41.6	16.3	58.4	0.0	100.0
Machinery	56.9	20.0	43.1	0.0	100.0
Transportation Equipment	19.5	12.7	80.5	0.0	100.0

JAPAN 1977

	MDC	(USA)	LDC	(OPEC)	WORLD
Textiles	27.0	10.9	43.7	19.4	100.0
Clothing	55.7	38.5	29.7	7.7	100.0
Wood and Paper Products	44.0	20.3	36.5	12.5	100.0
Miscellaneous Manufacture	69.6	32.8	20.1	8.6	100.0
Non-Metallic Minerals	48.7	30.0	23.6	23.9	100.0
Rubber Products	47.1	24.2	25.7	23.2	100.0
Basic Metals	36.6	23.5	29.7	19.6	100.0
Chemicals	29.0	11.4	48.0	8.8	100.0
Machinery	46.5	24.5	31.0	16.6	100.0
Transportation Equipment	55.5	28.1	29.9	13.1	100.0

KOREA 1978

	MDC	(USA)	LDC	(OPEC)	WORLD
Textiles	54.6	4.7	45.3	13.7	100.0
Clothing	93.6	43.8	6.3	2.6	100.0
Wood and Paper Products	79.4	46.4	20.6	12.3	100.0
Miscellaneous Manufacture	89.6	47.9	10.4	3.7	100.0
Non-Metallic Minerals	38.7	11.6	61.3	25.9	100.0
Rubber Products	41.2	22.5	58.8	18.9	100.0
Basic Metals	63.9	45.7	36.1	19.2	100.0
Chemicals	39.1	7.6	60.9	5.9	100.0
Machinery	78.9	49.0	21.1	6.2	100.0
Transportation Equipment	54.8	15.1	45.2	32.1	100.0

out the period. In 1965, the MDC-LDC (including OPEC) split was 68.7% to 31.2% (2/3 to 1/3, as opposed to Japan's 50%/50% split). This heavy dependence on MDC markets, and notably on that of the United States grew during the late 1960s. By 1970, over 85% of all of Korea's manufactured exports were destined to developed market economies (as compared to 55% of Japan's), and over 1/2 to the United States alone (1/3 in the case of Japan). During the 1970s, there is evidence of a relative shift away from the MDC (including the U.S.) markets, and in favor of OPEC. By 1978, the compositional distribution of Korea's exports was similar to that in 1965—2/3 to MDC's (though the U.S. dropped from 2/3 to 1/2 of that total), and 1/3 to LDC and OPEC (though OPEC accounted for roughly 1/3 of this total, whereas in 1965 the figure was just over 1/10).

If one were to limit the analysis to the 1970s, then it is apparent that, in terms of market compositions, Korea's export trade was already becoming more similar to Japan's. In both countries, the relative importance of the United States was steadily shrinking, while OPEC's importance grew rapidly. The relative share of the exports to the MDCs, which was over 30 percentage points higher in Korea in 1970, was fewer than 20 percentage points higher by the late 1970s. The share to (non-OPEC) LDCs tended to drop slightly in Japan's export composition (33.1% to 30.8%), while in Korea, the respective LDC's share rose from 10.8% to 14.9%.

Thus, by the late 1970s, the composition of Korea's exports destinations was markedly more similar to Japan's than had been

true at the beginning of the decade.

IV. Product Composition

Focussing on the types of manufctured goods exported by each of the two countries, the nature of the commodities each exported in 1965, and the changes which took place in the respective commodity compositions, the similiarities become striking. Table 4A presents the respective figures for product groups (or sectors), divided into three groups, roughly representing light, intermediate, and heavy industry. It has been noted in the development planning literature that as countries move along the growth spectrum, both demand and factor availabilities dictate a structural transformation or shift from early dependence on light industry to growing dependence on heavy industry (including machinery).[1]

This shift is easily evident in the trade statistics of both countries. In Japan, the share of exports originating in light industry fell from 22.1% in 1965 to 6.5% in 1978. In Korea, the respective drop was from 65.5% to 48.6%. Thus, in both countries, the relative importance of light manufactures fell by roughly 16 percentage points.

Turning to the exports associated with heavy industry, the figures for Japan rose from 63.7% in 1965 to 81.8% in 1978. In Korea, the respective figures were 22.2% in 1965, and 35.6% in 1978. In both countries, the main sources of growth were concentrated in two sectors, machinery and transportation equipment.

Summarizing the findings in Table 4A, striking differences and interesting similiarities were noted. The main difference is that the relative share of exports of light manufactures was, and continues to be, greater in Korea. This is to be expected, since Korea's per-capita income is roughly 1/6 that of Japan, and its capital/employee endowment, roughly 1/3 as large. Hence, as noted earlier, both demand and factor availabilities explain the finding.

However, over time, there is a similarity in the nature of the changes which affected the respective export composition. In both

1 H. Chenery, "Interactions Between Industrialization and Exports," *American Economic Review* (May 1980), pp. 281-287.

countries the relative share of light-manufacture exports (notably textiles) fell. Within this group, there was a relative shift in Korea towards the more sophisticated sector, clothing (relative to textiles). Furthermore, the largest percentage increase occurred in the same sectors — machinery and transportation equipment.

Were the trends noted here true within each market, or were they primarily reflections of intermarket shifts? The answer may be seen in Tables 4A and 4B.

The figures in these tables tell an interesting story. If we start with Japan, we note that in 1965 the relative importance of commodities originating in heavy industry was greater in the LDC market than in that of the MDCs. This is a reflection of the duality noted by Tatemato & Ichimura, and verified by Heller.[2] This practice of targeting the products of heavy industry to LDCs is found with a vengeance in Korea's 1965 trade. Whereas the worldwide breakdown was 65.6% light, 22.2% heavy industry, the relative weights for Korea's LDC exports are reversed, 38.8% light, 49.3% heavy.

Moving from 1965 to 1978, evidence of a tendency to convergence is present in the Japanese data. Whereas the relative portions of heavy industry were 57.4% and 71.2% in MDC versus LDC in 1965, the relevant shares are much more similar in 1978 — 79.6% in MDC and 83.3% for exports to LDC markets.

Generally, one notes that by 1978 there is little distinction by market in terms of the relative portion of Japan's exports of heavy industry (mainly cars and machinery). The spread is from a high of 83.5% of all exports in OPEC to a low of 79.6% of all exports to MDCs.

In the case of Korea, on the other hand, a distinct dichotomy persists into 1978 in the proportions of exports originating in heavy industry as a percentage of all exports, with the spread being from a high of 56% to OPEC to a low of 31% to the MDCs.

Another noted difference is the way the U.S. market is viewed by each country, as compared to those of other MDCs. For Japan, no distinct differences characterize the U.S. market. In 1965 and in 1978, the relative proportions of "heavy" and "light" exports

2 Heller, P., "Factor Endowment Change and Comparative Advantage: The Case of Japan." *The Review of Economics and Statistics* (Aug. 1976, pp. 283-292).

Table 4A

JAPANESE EXPORTS BY COMMODITY TYPE (%)

JAPANESE EXPORTS TO WORLD

	1965	1970	1975	1978
Textiles	14.9	9.7	5.5	4.8
Clothing	5.0	3.5	1.0	0.9
Wood and Paper Products	2.2	1.7	1.0	0.8
Miscellaneous Manufacture	10.2	10.7	7.2	9.2
Non-Metallic Minerals	2.6	1.8	1.3	1.4
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	1.4	1.1	1.3	1.1
Basic Metals	22.1	20.9	23.6	18.2
Chemicals	7.1	6.9	7.3	5.6
Machinery	18.3	24.5	24.4	27.7
Transportation Equipment	16.2	19.2	27.5	30.3
TOTAL	100.0	100.0	100.0	100.0

JAPANESE EXPORTS TO LDCs

	1965	1970	1975	1978
Textiles	16.5	14.3	7.1	6.8
Clothing	2.7	1.6	0.9	0.9
Wood and Paper Products	1.7	1.8	1.0	1.0
Miscellaneous Manufacture	4.8	6.7	4.6	6.0
Non-Metallic Minerals	1.8	1.3	1.0	1.1
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	1.4	1.2	1.1	0.9
Basic Metals	18.4	18.2	19.3	17.5
Chemicals	8.3	8.7	10.2	8.6
Machinery	19.8	24.8	22.5	27.8
Transportation Equipment	24.7	21.4	31.9	29.4
TOTAL	100.0	100.0	100.0	100.0

JAPANESE EXPORTS TO MDCs

	1965	1970	1975	1978
Textiles	12.5	6.6	3.3	2.7
Clothing	7.2	4.8	1.2	1.1
Wood and Paper Products	2.9	1.7	0.8	0.7
Miscellaneous Manufacture	16.1	14.5	11.7	13.5
Non-Metallic Minerals	3.4	2.1	1.4	1.4
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	0.6	0.8	1.0	1.0
Basic Metals	25.2	20.1	19.9	13.9
Chemicals	4.2	4.6	4.3	3.4
Machinery	16.9	24.6	26.4	27.0
Transportation Equipment	11.1	20.1	30.1	35.3
TOTAL	100.0	100.0	100.0	100.0

JAPANESE EXPORTS TO OPEC

	1965	1970	1975	1978
Textiles	27.9	14.2	8.3	6.2
Clothing	4.6	1.1	0.5	0.5
Wood and Paper Products	1.6	2.7	1.2	0.7
Miscellaneous Manufacture	4.6	5.0	3.5	5.2
Non-Metallic Minerals	3.3	2.8	1.6	2.3
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	6.1	3.3	2.6	1.6
Basic Metals	19.6	28.8	35.1	23.4
Chemicals	4.4	5.9	4.8	3.2
Machinery	15.5	23.9	22.7	30.5
Transportation Equipment	12.5	12.2	19.8	26.4
TOTAL	100.0	100.0	100.0	100.0

JAPANESE EXPORTS TO USA

	1965	1970	1975	1978
Textiles	10.0	5.5	2.5	2.1
Clothing	9.0	6.6	1.6	1.4
Wood and Paper Products	3.3	1.9	0.6	0.7
Miscellaneous Manufacture	16.4	15.1	10.3	12.1
Non-Metallic Minerals	3.8	2.4	1.6	1.7
Petroleums & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	0.4	0.7	0.7	1.0
Basic Metals	30.0	22.4	23.4	17.2
Chemicals	2.0	2.8	3.2	2.5
Machinery	18.1	26.0	25.2	27.2
Transportation Equipment	7.0	16.5	30.8	34.1
TOTAL	100.0	100.0	100.0	100.0

Table 4B

KOREAN EXPORTS BY COMMODITY TYPE (%)

KOREAN EXPORTS TO WORLD

	1965	1970	1975	1978
Textiles	24.8	13.4	15.8	13.8
Clothing	23.4	36.4	32.8	29.8
Wood and Paper Products	17.3	14.8	6.4	5.0
Miscellaneous Manufacture	8.9	18.6	13.0	11.3
Non-Metallic Minerals	2.5	1.0	2.6	2.5
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	0.9	0.5	2.2	2.0
Basic Metals	16.7	4.3	8.3	9.3
Chemicals	0.4	1.8	1.7	3.1
Machinery	4.1	8.1	12.6	13.1
Transportation Equipment	1.0	1.3	4.5	10.1
TOTAL	100.0	100.0	100.0	100.0

KOREAN EXPORTS TO LDCs

	1965	1970	1975	1978
Textiles	36.2	48.2	30.7	24.4
Clothing	2.2	8.9	5.3	7.3
Wood and Paper Products	0.4	0.4	2.5	4.0
Miscellaneous Manufacture	2.8	4.4	4.3	4.6
Non-Metallic Minerals	6.5	6.3	8.9	6.0
Petroleum & Coal Products	0.0	0.0	0.1	0.0
Rubber Products	2.6	2.5	8.5	4.7
Basic Metals	40.2	7.5	15.3	13.2
Chemicals	0.7	11.1	2.6	7.3
Machinery	5.7	9.8	8.5	10.7
Transportation Equipment	2.7	0.3	13.2	17.8
TOTAL	100.0	100.0	100.0	100.0

KOREAN EXPORTS TO MDCs

	1965	1970	1975	1978
Textiles	19.7	8.4	12.1	10.1
Clothing	33.1	40.3	39.4	37.5
Wood and Paper Products	24.9	16.8	7.4	5.4
Miscellaneous Manufacture	11.6	20.6	15.1	13.6
Non-Metallic Minerals	0.7	0.2	1.0	1.3
Petroleum & Coal Products	0.0	0.0	0.2	0.0
Rubber Products	0.1	0.2	0.7	1.1
Basic Metals	6.0	3.8	6.7	8.1
Chemicals	0.2	0.4	1.4	1.6
Machinery	3.4	7.9	13.6	13.9
Transportation Equipment	0.3	1.3	2.4	7.4
TOTAL	100.0	100.0	100.0	100.0

KOREAN EXPORTS TO OPEC

	1965	1970	1975	1978
Textiles	89.5	71.7	34.9	17.6
Clothing	0.2	5.5	9.6	7.1
Wood and Paper Products	0.2	0.9	2.1	5.7
Miscellaneous Manufacture	1.4	3.5	4.1	3.9
Non-Metallic Minerals	0.5	6.2	20.6	6.0
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	7.0	3.6	6.4	3.6
Basic Metals	1.2	7.1	16.7	16.6
Chemicals	0.0	0.3	0.6	1.7
Machinery	0.0	0.8	4.4	7.5
Transportation Equipment	0.0	0.2	0.6	30.3
TOTAL	100.0	100.0	100.0	100.0

KOREAN EXPORTS TO USA

	1965	1970	1975	1978
Textiles	14.5	4.3	2.7	1.9
Clothing	33.1	38.9	39.2	37.7
Wood and Paper Products	34.1	18.8	11.3	6.7
Miscellaneous Manufacture	14.1	25.3	18.5	15.7
Non-Metallic Minerals	0.7	0.1	0.4	0.8
Petroleum & Coal Products	0.0	0.0	0.0	0.0
Rubber Products	0.1	0.2	0.7	1.3
Basic Metals	1.1	2.5	9.2	12.3
Chemicals	0.1	0.0	0.5	0.7
Machinery	1.8	8.9	16.2	18.5
Transportation	0.3	0.9	1.3	4.4
TOTAL	100.0	100.0	100.0	100.0

going to the United States are almost identical to those going to the whole MDC market. For Korea, on the other hand, distinct differences are evident (which are especially notable, since the United States comprises a large proportion of Korea's MDC market – see Table 3). In 1965, Korea's exports to the United States were distinctly tilted to the "light" side. The weight of "heavy" exports in the U.S.-bound export bundle was only 1/3 that of exports to all MDCs (including the United States). By 1978, the situation is reversed. The relative importance of "heavy" exports to the United States are now a bit greater than those to MDC markets as a whole.

By the late 1970s, another interesting similarity appears between Korea and Japan which relates to OPEC-bound exports. Both countries direct the highest portion of "heavy" exports to that market (Korea, notably ships). Also, by 1978, Korea, like Japan, exports a higher proportion of "heavy" than "light" manufactured exports to the LDC market.

Thus, when one analyzes the changes which took place in the manufactured exports of the two countries, one is struck by the similarities, both in the patterns of geographic distribution and in the respective patterns of commodity composition.

V. Market Shares

The next question we ask is: in which product groups were each of the two countries especially competitive in the mid-1960s, and in the late 1970s? Competitiveness is not easy to measure, since there are many forms of competitiveness in the marketplace. One measure may be lower prices, which, in turn, may reflect a large group of factors including quality differentials, better service warranties, dealer reputations, etc. We therefore choose a measure which abstracts from the underlying causes of the competitiveness, and which focuses on the results of the competitiveness. This measure is the market share, which is here defined as the value of Japan's (or Korea's) exports of a given product group divided by the value of all OECD exports of the same commodity group to a given market.

Tables 5 and 6 present the market shares of these two countries for each of eleven product groups for the world as a whole, and in each market separately.

An examination of Tables 5 and 6 reveals that, as expected, Japan's shares are larger than Korea's across the board. What is interesting is that by 1978, for certain product groups, Korea had attained world shares equal to or closely approximating those attained by Japan in 1965. These product groups are wood and paper products, and clothing, both "light-industry" manufactures.

Table 5

MARKET SHARES OF JAPANESE EXPORTS (% OF OECD)

ALL JAPANESE EXPORTS TO WORLD

	1965	1970	1975	1978
Textiles	18.2	18.4	15.0	15.3
Clothing	12.4	10.2	3.7	3.9
Wood and Paper Products	4.6	5.0	3.7	3.5
Miscellaneous Manufactures	12.0	15.1	12.4	16.5
Non-Metallic Minerals	10.7	10.3	8.5	10.2
Petroleum and Coal Products	2.1	1.4	2.3	2.7
Rubber Products	13.7	13.8	15.4	15.8
Basic Metal Products	11.7	14.1	19.1	19.1
Chemicals	5.3	6.6	7.6	6.6
Machinery	5.6	9.0	9.9	13.1
Transportation Equipment	9.1	11.7	17.9	21.6

ALL JAPANESE EXPORTS TO LDCs

	1965	1970	1975	1978
Textiles	41.4	52.7	49.0	48.2
Clothing	22.2	22.1	18.8	17.4
Wood and Paper Products	10.4	14.1	12.0	12.6
Miscellaneous Manufactures	13.9	22.1	21.1	26.9
Non-Metallic Minerals	19.1	20.2	19.6	21.3
Petroleum and Coal Products	7.9	9.9	20.5	24.8
Rubber Products	21.4	30.3	35.8	37.7
Basic Metal Products	23.5	30.6	35.4	40.8
Chemicals	10.0	13.3	16.4	15.5
Machinery	10.4	16.0	16.3	21.9
Transportation Equipment	20.9	24.0	33.7	36.3

ALL JAPANESE EXPORTS TO MDCs

	1965	1970	1975	1978
Textiles	10.3	9.3	5.2	5.8
Clothing	10.7	8.8	2.3	2.5
Wood and Paper Products	3.6	3.5	1.6	2.0
Miscellaneous Manufactures	11.8	14.0	10.9	15.0
Non-Metallic Minerals	8.6	8.2	5.5	6.9
Petroleum and Coal Products	1.3	0.2	0.4	0.4
Rubber Products	4.8	7.7	6.9	9.8
Basic Metal Products	8.8	9.8	11.1	10.8
Chemicals	2.4	3.5	2.9	2.8
Machinery	3.7	7.0	7.3	10.1
Transportation Equipment	4.6	9.0	12.8	17.4

ALL JAPANESE EXPORTS TO OPEC

	1965	1970	1975	1978
Textiles	43.6	37.4	47.8	36.8
Clothing	18.9	14.2	12.3	8.3
Wood and Paper Products	7.2	13.5	14.0	6.8
Miscellaneous Manufactures	9.1	12.2	14.9	16.5
Non-Metallic Minerals	22.7	23.5	16.6	18.1
Petroleum and Coal Products	0.0	3.5	0.1	1.2
Rubber Products	45.7	41.6	47.4	36.9
Basic Metal Products	16.3	26.6	37.2	32.1
Chemicals	5.4	7.7	12.5	9.8
Machinery	6.7	9.8	13.0	15.3
Transportation Equipment	9.7	10.2	17.6	25.0

ALL JAPANESE EXPORTS TO USA

	1965	1970	1975	1978
Textiles	43.8	38.8	38.7	40.1
Clothing	35.6	30.2	13.0	16.7
Wood and Paper Products	8.0	8.8	3.9	4.8
Miscellaneous Manufactures	39.2	43.4	36.8	47.0
Non-Metallic Minerals	36.3	35.1	28.7	35.3
Petroleum and Coal Products	1.4	0.3	0.2	2.7
Rubber Products	19.5	19.9	15.2	25.5
Basic Metal Products	29.4	33.7	37.2	35.7
Chemicals	8.5	15.4	13.0	12.8
Machinery	24.3	30.5	28.2	37.5
Transportation Equipment	10.6	15.0	25.8	33.1

Table 6

MARKET SHARES OF KOREAN EXPORTS (% OF OECD)

ALL KOREAN EXPORTS TO WORLD

	1965	1970	1975	1978
Textiles	0.4	0.9	3.3	6.3
Clothing	0.8	3.8	9.9	18.1
Wood and Paper Products	0.5	1.5	1.9	3.1
Miscellaneous Manufactures	0.1	0.9	1.7	2.9
Non-Metallic Minerals	0.1	0.2	1.3	2.6
Petroleum and Coal Products	0.0	0.0	2.5	0.4
Rubber Products	0.1	0.2	2.1	4.3
Basic Metal Products	0.1	0.1	0.5	1.4
Chemicals	0.0	0.1	0.1	0.5
Machinery	0.0	0.1	0.4	0.9
Transportation	0.0	0.0	0.2	1.0

ALL KOREAN EXPORTS TO LDCs

	1965	1970	1975	1978
Textiles	1.1	2.4	9.5	20.7
Clothing	0.2	1.6	5.0	17.0
Wood and Paper Products	0.0	0.0	1.3	6.4
Miscellaneous Manufactures	0.1	0.2	0.9	2.5
Non-Metallic Minerals	0.8	1.3	7.5	13.9
Petroleum and Coal Products	0.0	0.0	3.0	0.1
Rubber Products	0.5	0.9	11.9	23.7
Basic Metal Products	0.6	0.2	1.3	3.7
Chemicals	0.0	0.2	0.2	1.6
Machinery	0.0	0.1	0.3	1.0
Transportation Equipment	0.0	0.0	0.6	2.6

ALL KOREAN EXPORTS TO MDCs

	1965	1970	1975	1978
Textiles	0.3	0.7	2.9	4.8
Clothing	0.9	4.2	10.9	19.7
Wood and Paper Products	0.6	1.9	2.3	3.2
Miscellaneous Manufactures	0.2	1.1	2.1	3.4
Non-Metallic Minerals	0.0	0.1	0.6	1.4
Petroleum and Coal Products	0.0	0.0	2.5	0.4
Rubber Products	0.0	0.1	0.7	2.4
Basic Metal Products	0.0	0.1	0.6	1.4
Chemicals	0.0	0.0	0.1	0.3
Machinery	0.0	0.1	0.6	1.2
Transportation Equipment	0.0	0.0	0.2	0.8

ALL KOREAN EXPORTS TO OPEC

	1965	1970	1975	1978
Textiles	0.1	2.3	5.1	10.7
Clothing	0.0	0.8	6.1	12.8
Wood and Paper Products	0.0	0.1	0.6	6.0
Miscellaneous Manufactures	0.0	0.1	0.4	1.2
Non-Metallic Minerals	0.0	0.6	5.5	4.9
Petroleum and Coal Products	0.0	0.0	0.0	0.0
Rubber Products	0.0	0.5	3.0	8.3
Basic Metal Products	0.0	0.1	0.5	2.3
Chemicals	0.0	0.0	0.0	0.5
Machinery	0.0	0.0	0.1	0.4
Transportation Equipment	0.0	0.0	0.0	2.9

ALL KOREAN EXPORTS TO USA

	1965	1970	1975	1978
Textiles	1.4	2.0	5.7	7.1
Clothing	2.9	11.7	42.8	87.4
Wood and Paper Products	1.8	5.7	9.2	9.7
Miscellaneous Manufactures	0.7	4.8	9.0	12.1
Non-Metallic Minerals	0.1	0.1	1.0	3.4
Petroleum and Coal Products	0.0	0.0	0.0	0.0
Rubber Products	0.1	0.5	2.1	6.5
Basic Metal Products	0.0	0.3	2.0	5.1
Chemicals	0.0	0.0	0.3	0.7
Machinery	0.1	0.7	2.5	5.1
Transportation Equipment	0.0	0.1	0.2	0.9

Both countries tended to gain market shares during the entire period. Korea gained across the board, indicating that it was expanding exports faster than OECD in each and every manufacturing category, whereas Japan tended to lose shares in all the light-industry categories (textiles, clothing, wood, and paper products), while gaining in all others. By the late 1970s, Japan's competitiveness was greatest in the heavy-industry categories of transportation equipment and basic metals, whereas Korea's greatest strength was clearly in light industry and clothing.

Tables 5 and 6 present the respective market shares for each separate market. This allows us to see if the patterns of competitiveness differed from market to market. We noted above that by 1978 Japan's largest world market shares were in transport equipment and basic meals, whereas Korea's competitiveness was greatest in clothing and textiles. Was this true in all markets? The answer is no. Each exporter's relative strengths differ from market to market.

1. MDC vs. LDC

Both Japan and Korea play a relatively more significant role in the LDC market. In 1978, Japan's market shares in the LDC market ranged from a high of 48% (textiles) to a low of 13% (wood and paper products), as compared to a range from 17% (transport equipment) to 0.4% (petroleum and coal products) in the MDCs. The same pattern was true for Korea.

However, interesting differences between the two exporters do emerge. In textiles and clothing, Japan suffered sharp losses in MDC market shares (relative only to other OECD exporters). In the LDC market, on the other hand, Japan's shares in textiles and clothing did not tend to drop. The same pattern was true for chemicals, nom-metallic minerals, and wood and paper products, which tended to fall in the MDCs but not in the LDCs. In fact, except for clothing, all of Japan's decreases in world competitive shares are accounted for by its experience in the MDC market. The only big Japanese success stories in the MDC market were for machinery, miscellaneous manufactures, rubber products, and (especially) transportation equipment.[3]

3 It is probable that these results reflect, at least in part, various "orderly marketing agreements."

Korea, on the other hand, gained market shares in each and every product group in both the MDC and LDC markets.

2. *The U.S. Market*

The U.S. market was of special significance both to Japan and Korea during this period, if only for its absolute size. From Table 3A above, we note that in the mid-1960s it absorbed close to a third of all of Japan's exports, and close to one-half of Korea's. Even by the late 1970s, the relative shares were still very significant (one-fourth of Japan's, and a third of Korea's exports). Comparing the U.S. market (Table 5C) to that of all MDCs (Table 5B) in 1978, we note significant differences. Japan was relatively competitive in the United States, in that the market shares across the board exceeded those of Japan's exports to the MDCs as a group. This was especially true in textiles and clothing, where U.S. shares were more than six times greater than those in all the MDC markets.

Korea also tended to have captured higher shares of the U.S. market than of all MDCs, though the differentials were not as large as Japan's. In several categories, the shares were not significantly different. The categories in which Korea's 1978 share in the United States exceeded three times that of all MDCs were machinery, basic metals, wood and paper products, clothing, and miscellaneous manufactures.

Thus, the Untied States played a different role for each of these countries. For Japan, the United States was an especially important market for the labor-intensive products of its light manufactures, while for Korea, the United States was an especially important market for both more sophisticated manufacturing products (e.g., machinery) and less sophisticated light manufactures (e.g., clothing).

3. *The OPEC Market*

The OPEC market is of special interest for many obvious reasons. Its potential in terms of available purchasing power is the most rapidly rising in the world, and already, during the period covered, it tended to absorb a rapidly growing portion of the exports of the two countries (Table 3A).

If we compare the OPEC market (Table 5E) to the LDC (Table

5D), we find that during the period observed, Japan tended to lose relative ground in OPEC to other OECD exporters. While in 1965 Japan's shares in OPEC exceeded its shares in LDCs in three product groups (textiles, non-metallic minerals, and rubber products), its OPEC shares in 1978 were lower than its LDC shares in every product category.

Like Japan, Korea's experience with the OPEC market was a bit disappointing. Although, unlike Japan, Korea increased its market shares there from 1965 to 1978 in every product category, this was hardly an impressive feat, since it hardly had any share of this market at all in 1965. Its OPEC market shares in 1978 were lower in all categories, except transport equipment, than the corresponding all LDC shares.

VI. A Dynamic Comparison

Finally, one many wish to ask the following questions, to what extent was there a transformation evident in the nature of each country's competitiveness? That is, did Japan or Korea tend over time to develop a competitiveness in new product groups? Was this especially true with one or the other? Did it especially apply to a particular market? To the extent that such changes were taking place, was the emerging Korean pattern converging on that of Japan?

We attempt to answer these questions by analyzing zero order (Spearman) correlations between the market shares of each exporter in each market for the initial (1965) and final (1977/78) period. These coefficients are found in Table 7. The market share changes in each market in Table 7A are similarly analyzed.

Let us posit the null hypothesis that there was no significant difference between two market shares. With our sample size, we can reject or accept this hypothesis with 95% confidence if the correlation coefficient is greater than 0.55. At the 90% level, any coefficient greater than 0.48 may be accepted as indicating that the shares are in fact similar.

1. The 1965 Pattern Versus That of 1977/78 of Each Respective Exporter

The correlation coefficients of Table 7 were derived from the

Table 7

CORRELATION COEFFICIENTS BETWEEN RESPECTIVE MARKET SHARE CHANGES

	1965										1977/78					
	World		HDC		USA		LDC		OPEC		World	MDC	USA		LDC	OPEC
	Jap.	Kor.	Jap.	Kor.	Jap.	Kor	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.
1965																
World																
Japan																
Korea	.38															
HDC																
Japan																
Korea			.40													
USA																
Japan																
Korea					.35											
LDC																
Japan																
Korea							.83									
OPEC																
Japan																
Korea									.80							
1977/78																
World																
Japan	.54	-.39									-.29					
Korea	.46	.89														
MDC																
Japan			.29	-.42								-.28				
Korea			.52	.88												
USA																
Japan					.75	-.22							-.16			
Korea					.35	.82										
LDC																
Japan							.77	.62							.35	
Korea							.69	.69								
OPEC																
Japan									.80	.65						.32
Korea									.72	.56						

Table 7A

CORRELATION COEFFICIENTS BETWEEN RESPECTIVE MARKET SHARE CHANGES

	1965-1970										1970-1977/78					
	World		MDC		USA		LDC		OPEC		World	MDC	USA		LDC	OPEC
	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.	Jap.	Kor.
1965																
World																
Japan																
Korea	-.52															
MDC																
Japan																
Korea			-.47													
USA																
Japan																
Korea					-.42											
LDC																
Japan																
Korea							.01									
OPEC																
Japan																
Korea									-.73							
1977/78																
World																
Japan	.74	-.69									-.68					
Korea	.64	.88														
MDC																
Japan			.89	-.62								-.64				
Korea			-.48	.90												
USA																
Japan					.50	-.67							-.66			
Korea					-.53	.87										
LDC																
Japan							-.02	.75							-.52	
Korea							.29	.71								
OPEC																
Japan									.26	-.32						-.54
Korea									-.67	.68						

market shares for Japan (Table 5) and for Korea (Table 6). We begin by focusing on the first column of Table 7, which refers to total exports of both countries.

The first finding is that, of the two countries, Japan's overall pattern of competitiveness underwent a more notable change than did Korea's. The correlation between Japan's world market shares in 1965 and Japan's 1978 shares is 0.54; while Korea's respective figure is 0.89. This is a surprising finding. One would have expected Korea to have experienced a greater shift in the pattern of competitiveness, since it started with a low base and expanded its exports so rapidly.

In which markets were the greatest changes in these patterns evident? For Japan the answer is clear. While the share patterns for the LDC and OPEC markets had not significantly changed from 1965 to 1978 (the correlation for LDC was 0.75, and for OPEC, 0.80), that for the developed market economies (MDC) had clearly undergone a significant transformation ($r = 0.29$). What this means is that, in the LDC market, those product categories in which Japan had relatively large market shares in 1977 were also those in which it held relatively large shares in 1965. In the MDC markets (other than the United States) this was not the case.

For Korea, the situation was somewhat reversed. The highest degree of similarity is found for the MDC market ($r = 0.88$), while the evidence of greatest change is found in OPEC ($r = 0.56$) and in LDC ($r = 0.69$) as a whole. The U.S. market was a "stagnant" one (relative to all MDC markets) in that for both exporters the relative share "winners" of the mid-1960s remained the "winners" of the late 1970s (for Japan, $r = 0.75$; for Korea, $r = 0.82$).

Were the changes in the patterns of competitiveness constant throughout the period? The 1970s presented quite a different economic picture to both exporters, when compared to the mid-to-late-1960s. The earlier period, 1965-70, was one of very rapid export growth for both countries. World prosperity, and unflagging world market growth (and unremitting conflict in Vietnam) contrasts sharply with the recessionary oil-crisis-ridden 1970s. Were the differences in competitiveness patterns between 1965 and 1977/78 the result of discrete and sharp changes in the 1970s, or were they basically the results of longer trends dating back to 1965? The former would suggest that the changes observed reflect to a

larger extent rapidly changing market opportunities and changes in factor prices and (perceived) availabilities. The latter would suggest that the changes observed are equilibrium situations, which are based on changing patterns of comparative advantages, which in turn reflect changes in domestic resource and factor ratios (including such considerations as the availability of skilled labor and of experience, as well as the more classically considered capital and labor endowments).

In order to examine the nature of these changes, we turn to Table 7A, which presents the correlations between the changes in market shares from 1965 to 1970 on the one hand, and from 1970 to 1977/78 on the other. From the first column, we note that for all exports, the changes for both countries were fairly stable. The correlation of 0.74 for Japan and 0.88 for Korea indicate that in both cases those products in which relatively large share points were gained in the 1970s were also share-gain winners in the 1960s. This suggests that the changes observed in the competitiveness patterns of both countries reflect long-term adjustments to changing factor endowments.

Let us examine in turn the nature of share changes in each market in which significant pattern changes were found. As noted above, Japan's major changes were in the MDC market, whereas Korea's largest change was in the OPEC market. We find that in both cases, the changes in the 1970s tended to represent a continuation of trends established in the 1960s. The correlation between two changes for Japan's exports to the MDC market is 0.89; for Korea's to OPEC, $r = 0.68$.

Interestingly, in both the LDC and the OPEC markets, Japan's share gains in the 1970s tended not to be in the same commodities in which it gained relatively in the 1960s. This may indicate a greater marketing flexibility, and an ability to rapidly "shift gears" in response to rapidly changing conditions (especially in OPEC) than Korea's.

2. Are the Patterns Converging?

To shed light on this issue, we again turn to Table 7. First we note that the all-export market-share patterns of the two countries differed significantly one from the other, both in 1965 ($r = 0.38$) and in the late 1970s ($r = 0.29$). Over time, there was a divergence

in those markets (LDC and OPEC) in which the patterns were similar in the mid-1960s. Thus, in 1965 the correlation between the two countries' patterns was 0.80; in 1977/78, it dropped to 0.32.

However, it is not surprising that Korea of the late 1970s differed substantially from Japan of the late 1970s. What is of interest is whether Korea is moving, with a lag to be sure, in the direction of Japan's position. The question we ask is whether Korea's 1978 pattern is similar to that of Japan's in the mid-1960s. The answer, again from Table 7, is mixed. The correlation for all exports (column 1) between Korea of 1978 and Japan of 1965 is 0.46, indicating that the patterns were not quite similar (at the 90% level, they are just barely similar). However, in individual markets, the patterns were found not to differ one from the other. This is especially true in the LDC market ($r = 0.69$) and in the OPEC market ($r = 0.72$). Even in the MDC market (though not in the U.S.), the two may be said not to differ statistically one from the other at the 90% significance level ($r = 0.52$). Thus, the overall difference is found to be in large part due to differing market distributions (which, as noted earlier, are also tending to converge). In individual markets, and especially in the LDC markets (and OPEC), Korea in 1978 tended to successfully complete by and large in the same product groups in which Japan had succeeded a decade earlier.

VII. The Factor and Characteristic Embodiment of Exports

A classical view of commodity trade is as a vehicle for compensating for the immobility (across borders) of factors of production. Thus, a relatively capital rich country will tend to "export capital" by maintaining a net export balance in capital-intensive goods. This is the view associated with price competition when comparative advantage is established along classic Heckscher-Ohlin lines.

An alternative view of trade is summarized by one or another variant of the "product-cycle" theory. Here, trade is either the reflection of "Schumpeterian competition," resulting from a technology gap caused by a wave of innovations,[4] or the result of

4 See R. Nelson, "Technological change and Factor Mix Over the Product Cycle," *Journal of Development Economics*, 1977, pp. 3-24, for a recent formalization of this model.

deliberate applications of "product-development" efforts involving R&D.[5] In either case, the result is a competition involving quality, or "sophistication," rather than prices.

Do the exports of Korea and Japan follow the patterns which one or the other of these theories would lead us to expect? The answer, which will be explored in this section, is in both cases yes. We shall examine each by directly observing embodied factor intensities associated alternatively with each of the two general theoretical approaches to explaining evolving international competitiveness.

1. The Heckscher-Ohlin Factor Endowment Approach

a. Physical Capital Intensity

If we accept the basic assumptions of this approach — in particular, identical technologies (and no effective reversals), then the expectations are fairly clear. In 1965, Japan was clearly more richly endowed both in physical and in human capital. Therefore, we would have expected to find its exports more heavily weighted with capital-intensive commodities.

During this period, Japan's capital stock tended to grow more rapidly than that of Korea. From 1960 to 1970, Japan's average capital/output ratio grew at an annual average rate of over 9%, whereas Korea's grew at close to 5%.[6] Furthermore, from 1965 to 1978, the average ratio of investment to GDP was roughly 20% in Korea, and 30% in Japan.[7] Thus, we would expect to find Japan's export mix shift to a relatively more capital-intensive set of commodities during the period studied.

The results concerning physical and human capital are presented in Tables 8 and 9. Table 8 was calculated by applying the capital/labor ratio derived for each commodity from the 1963 U.S. input-output table to the exports of Japan and of Korea. Since the same technology was applied to both countries (as demanded by the underlying theory), differences reflect product compositions. For all exports, the results are as expected. In 1965,

5 J. M. Finger, 1977.

6 Poduval and Kubo, The Input-Output Data Bank of the "Sources of Industrial Growth Research Project," World Bank (draft) Nov. 7, 1979.

7 IMF I.F.S.

Table 8

PHYSICAL CAPITAL (PER EMPLOYEE)

Japanese Exports by Destination

	1965	1970	1973	1975	1977
All Exports	945.7	1,239.1	1,362.0	1,401.4	1,564.8
Developed Market Economies	968.7	1,351.6	1,616.1	1,794.1	1,868.1
United States	1,009.6	1,451.9	1,840.8	2,056.1	2,154.3
Developing Countries	930.1	1,031.6	982.2	975.5	1,139.7
OPEC	880.3	1,298.6	1,469.1	1,423.0	1,658.5

Korean Exports by Destination

	1965	1970	1973	1975	1978
All Exports	711.8	419.4	556.5	465.2	521.8
Developed Market Economies	376.4	402.8	505.6	457.6	495.2
United States	337.0	380.6	497.4	475.6	533.5
Developing Countries	1,461.5	546.6	865.6	491.7	727.8
OPEC	357.2	525.5	1,061.6	525.9	459.0

* K/L from Hufbauer (1970), weighted by export values. Japan's trade figures from OECD Commodity Trade Statistics (Series C). Korea's, UN Trade by Commodity.

Japan's exports are more heavily concentrated in capital-intensive commodities, and become relatively more capital intensive throughout the 1960s and 1970s.

When examining the physical capital embodied in exports to individual markets, a clear difference appears between the two countries' exports. In 1965, Japan's exports to Modern Developed Countries (MDCs) and Less Developing Countries (LDCs) were of roughly the same capital intensity, whereas Korea's exports to the LDCs were very much more highly capital intensive.

During the late 1960s, Japan shifted to a higher concentration of capital-intensive exports in both markets, but this shift was more rapid in the MDCs, so a gap began to widen. During that same period, Korea's exports to MDCs increased, but those to LDCs decreased in capital intensity, so the difference between the capital embodied in each market was greatly reduced by 1970.

Through the 1970s, the trend noted for Japan continued, and the MDC-LDC gap widened. Thus, by 1977, Japan's exports to the

MDCs were clearly more capital intensive than those to the LDCs. Within the MDCs, the U.S.-bound exports were relatively capital intensive, as were OPEC-bound exports relative to the LDC market.

For Korea, the situation during the 1970s was reversed. The shift to more capital-intensive goods (generally erratic) was relatively stronger in LDC-bound exports, so that the gap in favor of LDCs tended to widen. Since the mid-1970s, U.S.-bound exports tended to be somewhat capital intensive within the MDC group.

Of the two, the trends observed for Korea are more in accord with theoretical expectations. As both countries' incomes tended to rise relative to their trade partners, one would have expected the (increasingly) more capital-intensive flows to be directed to the (capital poor) LDCs.

b. Human Capital Indensity

Table 9 depicts the human-capital ($100/employee) embodied in the respective export flows. This figure was calculated by subtracting the wage of an unskilled worker from the average wage of each industry (in the United States in 1963), and capitalizing the resulting differential at 10%. First, the dollar amounts are quite smaller than the values of physical capital/labor embodiments. No normative conclusion may be drawn from this, since it is not clear that both forms of capital are perfect substitutes one for the other.

We note that, again Japan's exports are more (human) capital intensive than Korea's. However, in relative terms, Korea did tend to catch up. By 1978, the human-capital intensity of Korea's total exports equaled Japan's of 1965. This time there is a general similarity in the market distribution of this factor. The MDC-bound exports from both countries are more human-capital intensive than those to the LDCs (from each respective exporter).

As was true for physical capital, the U.S. market absorbed Japanese exports, which were human capital intensive relative to the other MDCs, throughout the period, and the same was true for Korea during the 1970s. In fact, during the 1960s, Korea's exports to the United States were poor in human-capital embodiment (relative to the MDC market). The two were roughly equal in 1970,

Table 9

HUMAN-CAPITAL EMBODIMENT

Japanese Exports by Destination

	1965	1970	1973	1975	1977
All Exports	75.9	95.0	95.5	87.0	96.4
Developed Market Economies	90.0	114.2	118.7	115.3	120.1
United States	105.8	138.0	133.1	121.5	127.7
Developing Countries	63.4	71.2	71.4	65.4	72.8
OPEC	66.7	85.7	81.3	79.2	89.1

Korean Exports by Destination

	1965	1970	1973	1975	1978
All Exports	40.3	36.2	52.5	55.6	71.6
Developed Market Economies	41.7	36.7	54.0	59.2	79.0
United States	36.7	36.4	69.5	65.2	100.2
Developing Countries	37.6	34.2	44.0	42.9	58.4
OPEC	20.3	26.9	35.8	37.1	42.7

*Human Capital from Branson and Monoyios (1977), Appendix (weighted identically as Table 8).

and a clearly widening gap opened up during the 1970s.

2. *The Product-Cycle Approach*

The three measures whose embodiments are analyzed here are R&D intensity, product-turnover ratio, and first-trade date. Each is a measure of product sophistication. The R&D intensity is the expenditure on R&D divided by dollar sales. The product turnover is an inverse measure of standardization. It measures the number of seven-digit Schedule B products, which either dropped out or were added to the list of U.S. exports from 1965 to 1971, divided by the initial number of seven-digit commodities in each three-digit SITC commodity group. The first trade date is the date at which the three-digit SITC commodity first appeared in the U.S. trade statistics. Thus, it indicates "older" and "newer" products.

Table 10 presents the R&D intensity embodied in the export flows of each of the countries.

Table 10

RESEARCH AND DEVELOPMENT INTENSITY

Japanese Exports by Destination

	1965	1970	1973	1975	1977
World	2.252	2.909	3.028	2.725	3.082
United States	2.461	3.389	3.681	3.301	3.564
EEC	2.658	3.512	4.029	3.782	4.055
Other Developed MDC's	2.005	2.648	2.832	2.992	3.078
LDC	2.175	2.610	2.595	2.412	2.769
OPEC	1.801	2.449	2.497	2.187	2.741
Command	2.260	2.201	1.822	1.973	1.843

Korean Exports by Destination

	1965	1970	1973	1975	1978
All Exports	1.11	1.65	2.02	2.13	2.30
Developed Market Economies	1.12	1.62	2.06	2.26	2.44
United States	1.09	1.62	2.40	2.33	2.68
Developing Countries	1.08	1.79	1.92	1.86	2.11
OPEC	0.61	0.75	0.93	0.92	1.22

Source: R & D (as % of sales) from NSF.

The results are as expected. Japan's trade is more heavily concentrated in "high technology" goods. In 1965, the average R&D embodiment of Japan's exports were twice that of Korea's. By the late 1970s, the gap narrowed, and Korea's "high technology" composition, as reflected by the R&D figure, approximately Japan's of the mid-1960s.

Over the period 1965-77, the shift to higher R&D-intensive goods was especially noted in Japan's exports to the MDCs, compared to its exports to the LDCs, so that the gap which was rather narrow in 1965 tended to clearly widen by 1977. Korean exports to MDCs also tended to be slightly more R&D intensive than those to LDCs in 1965, and the gap was maintained through the 1970s,but not widened.

One notable difference between the two countries is the relative intensity in OPEC-bound exports. Such Korean exports were considerably less R&D intensive than those to either the MDCs or the LDCs. This was not especially true for Japan's exports to OPEC.

Table 11

PRODUCT-TURNAROUND RATIO

Japanese Exports by Destination

	1965	1970	1973	175	1977
All Exports	7.5	9.2	9.7	9.8	10.3
Developed Market Economies	7.6	9.6	10.6	11.1	11.3
United States	8.0	9.9	11.5	11.9	12.2
Developing Countries	7.1	8.5	8.1	7.8	8.5
OPEC	8.8	10.5	11.2	11.2	11.8

Korean Exports by Destination

	1965	1970	1973	1975	1978
All Exports	4.2	3.5	5.8	6.4	6.4
Developed Market Economies	2.0	2.9	5.4	5.8	5.1
United States	2.0	2.8	5.1	6.0	5.3
Developing Countries	9.1	6.2	8.7	9.8	9.7
OPEC	4.5	6.1	7.9	7.8	9.6

Source: J. Finger, 1975.

Another difference relates to OPEC. Whereas Japan's exports to that market tended to be less standardized (hence more "sophisticated") than to the LDCs, this was not true for Korea's exports to OPEC.

VIII. Conclusion

When one looks "below the surface" and observes trade flows defined along dimensions of embodied factors and inherent characteristics, one finds many indications that Korea's export composition is shifting to a pattern that resembles that of Japan of a decade or more ago.

In terms of the traditional factor ratio (physical capital per employee), there is no indication of a convergence. Japan's exports in the 1960s were more heavily weighted with capital-intensive products, and there has not been any clear indication that Korea is "catching up."

However, in terms of other "neo-technological" factors, the story is quite different. By 1978, the human capital per employee embodied in Korea's exports closely resembled Japan's of 1965. The same was true with embodied R&D and an inverse measure of product standardization.

When focussing on the MDC-LDC market differences, the hypothesis that Korea is treading on Japan's heels is strengthened. In the mid-1960s, the capital/labor ratio embodied in Japan's exports to these two markets was roughly identical. During the 1950s and 1960s (as documented by P. Heller) and the 1970s (as documented here), the shift to capital-intensive products was more rapid in Japan's exports to the MDCs. Korea started, in 1965, with the familiar picture of exporting relatively capital-intensive products to the LDCs. Throughout the past fifteen years, the capital intensity in MDC-bound exports rose markedly relative to Korea's exports to the LDCs. Thus, Korea is found to replicate the "convergence" process undergone by Japan in the 1950s and early 1960s, first noted by Tatemoto and Ichimura.

Interesting similarities are noted in terms of embodied human-capital. The export compositions of both countries to the MDC market are more heavily weighted in human capital than their respective exports to the LDCs. Over time, Korea's ratio of human capital between MDC and LDC had converged, so that by 1978 it closely resembled Japan's in the mid-1960s.

The hypothesis that Korea's export posture is replicating Japan's experience, with a lag of some 10-15 years, is given dramatic support when one examines their respective trade flows in terms of "sophistication" as measured either by embodied research and development, or by (the inverse of) the measure of product standardization.

While Japan's exports are, expectedly, more heavily weighted in relatively sophisticated products, the amount of R&D embodied in Korean exports in 1978 closely approximates that embodied in Japan's 1965 exports. The same is substantially true for the "product turnover" measure.

References

Chenery, H., "Interactions between Industrialization and Exports, *American Economic Review* (May 1980).

Nelson, R., "Technology Change and Factor Mix Over the Product Cycle," *Journal of Development Economics* (1977).

Poduval and Kubo, *The Input-Output Data Bank of the "Sources of Economic Gowth" Research Project,* World Bank (draft) (November 7, 1979).

Finger, J., "A New View of the Product Cycle Theory," *Weltwirtschaftliches Archiv* (I, 1975), pp. 79-99.

Heller, P., "Factor Endowment Change and Comparative Advantage: The Case of Japan 1956-1969," *The Review of Economics and statistics* (Aug. 1976), pp. 283-292.

Hufbauer, G., "The Impact of National Characteristics and Technology on the Commodity Composition of Trade in Manufactured Goods," Vernon R., ed. *The Technology Factor in International Trade* (NBER, 1970).

Branson, W. and Monoyios, N., "Factor Inputs in U.S. Trade," *Journal of International Economics* (1977), pp. 111-131.