Korea's Bilateral Trade with Japan and the United States: A Comparative Study

Taegi Kim and Hong Kee Kim*

This paper examines the development of Korea's trade structure with Japan and the United States over the past 30 years. Three aspects of the trade structure are investigated: changes in trade patterns, changes in the decomposition of total trade growth, and import and export elasticities. We find that there are major differences between Korea's trade with Japan and Korea's trade with the United States: Korea's intra-industry trade with Japan is higher than that with the United States. The contribution of intra-industry trade to Korea's total trade growth has increased over time. The trade pattern of Korea with Japan has become more similar to that with the U.S. in terms of intra-industry trade while it has diverged from it in terms of inter-industry trade. Also, Korea's import and export price elasticities are larger for trade with the United States than for trade with Japan. (*JEL* Classification: F11, F12, F14)

I. Introduction

The Korean economy has grown rapidly during the past 30 years. The high rate of growth of international trade is one of the major factors that contributed to the high economic growth rate in Korea. From the point of view of trading partners, the United States (U.S.) and Japan both played important roles in Korea's trade growth. Korea's trade share with the U.S. and Japan was an average of

*Professor, Department of International Trade, Chonnam National University, 500-757, Korea, (Tel) +82-62-530-1455, (E-mail) tgkim@chonnam.chonnam.ac.kr; Associate Professor, Department of International Trade, Hannam University, 306-791, Korea, (Tel) +82-42-629-7597, (Fax) +82-42-636-5879, (E-mail) hongkee @eve.hannam.ac.kr, respectively. This study was financially supported by Chonnam National University in the program, 1995.
[**Seoul Journal of Economics** 1999, Vol. 12, No. 3]

72.8% of its total international trade during the period 1962-70, 59.2% between 1971-80, and 50.7% between 1981-90.

Although both the United States and Japan are almost equally important to Korea in terms of transactions in goods and services, trade pattern with each country is different. We observe that Korea's overall trade surpluses are accompanied by trade deficits with Japan. Korea's main exports and imports also differ depending upon its trading partner. Whereas Korea's main imports from the U.S. are composed of agricultural products and raw materials, imports from Japan are composed of intermediate goods.

The differences in Korea's trade patterns with important trading partners result in significant differences in trade balances, which have raised concerns about trade conflicts and protectionist pressures. This paper examines how Korea's bilateral trade patterns differ and how they have changed over the past 30 years with respect to its two most important trading partners, the United States and Japan.

This comparative study on bilateral trade will be performed in three ways. First, we examine changes in intra-industry trade between Korea and each country. Second, we investigate Korea's trade structure using correlation coefficients of trade indices and the decomposition of trade growth. Finally, we compare bilateral trade patterns with the two countries by estimating and examining trade elasticities.

This paper is organized as follows. Section II presents an overview of Korea's trade relations with Japan and the U.S. with respect to trade shares and trade balances. Section III presents the analytical framework used to measure trade patterns and import and export elasticities. Section IV presents empirical results, showing how Korea's trade with Japan differs from its trade with the U.S. Some concluding comments are provided in Section V.

II. An Overview of Korea's Trade Relations with Japan and the U.S.

Japan and the U.S. have been Korea's most important trading partners. Until 1990, Korea's trade share with Japan and the U.S. was over 50% of its total trade. Even if this figure has declined over time, it remains over 40% of total trade.

TABLE 1

KOREA'S TRADE SHARE MATRIX (%)

Product Group (SITC)	*YR*	Japan		USA		Rest of World		World	
		Export	Import	Export	Import	Export	Import	Export	Import
food & raw materials (0-4)	65	21.2	5.2	6.6	28.0	11.1	13.2	38.9	46.4
	75	9.2	2.3	1.6	16.6	7.5	29.4	18.2	48.4
	85	5.1	1.2	1.0	8.7	2.1	31.2	8.2	41.0
	95	2.4	1.1	0.4	5.6	3.0	21.6	5.7	28.3
manufac-tured products (5-8)	65	3.8	31.9	28.7	12.5	28.5	9.2	61.0	53.6
	75	16.0	31.1	28.8	9.2	36.7	11.3	81.5	51.6
	85	9.8	23.0	34.7	12.1	47.3	23.6	91.7	58.7
	95	11.3	23.5	19.5	17.1	63.4	30.8	94.2	71.5
all products (0-9)	65	25.1	37.0	35.2	40.5	39.7	22.5	100.0	100.0
	75	25.3	33.4	30.3	25.9	44.3	40.7	100.0	100.0
	85	15.0	24.2	35.6	20.8	49.4	55.0	100.0	100.0
	95	13.7	24.6	19.9	22.8	66.4	52.5	100.0	100.0

Note: Each figure denotes each country's trade share in Korea's total exports or total imports.

Source: United Nations, Trade Tapes.

Table 1 shows the trade share matrix with respect to each country or country group and each product group.[1] This matrix shows Korea's trade balance and trade structure with each trading partner. Each cell in Table 1 represents Korea's export (import) share of a given product group with respect to a specific trading partner. In the food and raw materials group, Korea's export share with Japan has always been higher than its import share, but with the U.S., Korea's import share has always been higher than its export share. This implies that in the food and raw materials group, Korea has a trade surplus with Japan and a trade deficit with the U.S.

However, in the manufactured products, Korea has a trade surplus with the U.S. and a trade deficit with Japan, as Korea's import share is larger than its export share in trade with Japan,

[1]We divide industries into two sectors: food and raw materials (SITC 0-4) and manufactured products (SITC 5-8). Thus the total share can be under 100 percent, since SITC 9 commodities are excluded in this classification.

but Korea's export share is larger than its import share in trade with the U.S.

Table 1 also indicates that during the last 30 years Korea's export and import structure has changed drastically. The export and import share of the agricultural sector has decreased, while that of the manufactured products sector has increased. In 1995, manufactured goods accounted for 94.2% of total exports and 71.5% of total imports. These figures imply that the trade in manufactured products has become a more important component of Korea's international trade.

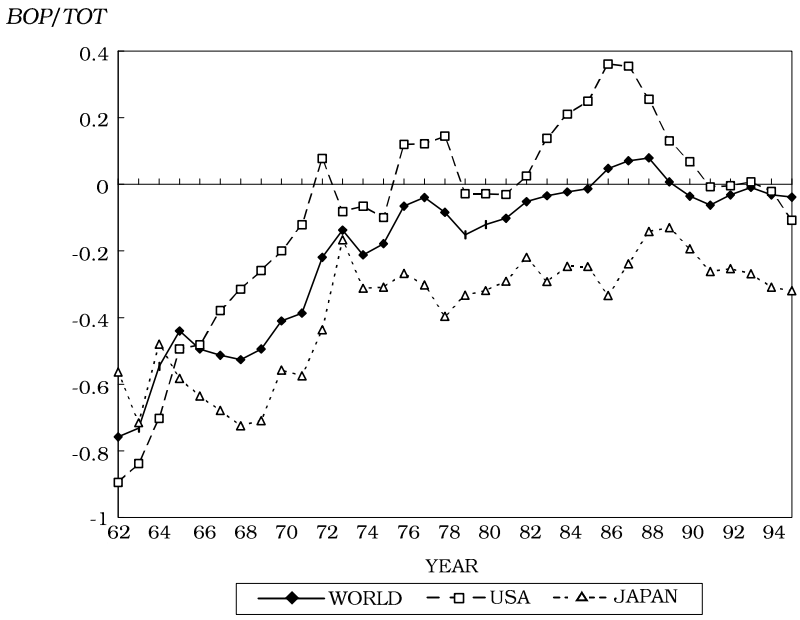
Figure 1 shows changes in the ratios of Korea's trade balance in total trade with the world, the U.S., and Japan. Korea's trade balance has improved gradually, and Korea experienced a total trade surplus for the four years from 1986-9. Korea's international trade balance is better than its trade balance with Japan, but worse than its trade balance with the U.S. Even if Korea's trade balance has generally improved, Korea maintains a large trade deficit with Japan. Korea's trade balance with the U.S., however, was in deficit for most of the years prior to 1982, but moved to a surplus position from 1982 to 1989. The trade surplus with the U.S. increased until 1986, but has decreased since. In 1990 Korea's total trade balance was once again in a deficit position, due to deterioration in its trade balance with the U.S. and with Japan.

The international trade policies of Korea and the U.S. have affected the trade balance between the two countries. The U.S. pressed Korea to open its markets, particularly in the latter half of the 1980s.[2] In response to U.S. pressure, Korea substantially liberalized overall import regulations.[3] This liberalization included the removal of quantitative restrictions, the reduction of tariff rates, and the abolition of a surveillance system that was intended to guard against harmful surges in imports.[4] Additionally, the Korean currency started to appreciate from 1987. Over the next three years,

[2]Nam (1993) details the number of administered protection cases initiated in the U.S. against Korean exports in the 1970s and 1980s.

[3]Lee (1992) argues that Korea's import policies can be divided into two phases: import restrictions before 1980 and import liberalization since 1980.

[4]The degree of openness rose from 67.94 percent in 1980 to 96.34 percent by 1990. The average tariff rate was 24.9 percent in 1980, but decreased to 11.4 percent by 1990. Average tariff rates for manufactured products came down much more rapidly than those for agricultural products.



Note: *BOP/TOT* denotes the ratio of trade balance to total trade.

FIGURE 1

KOREA'S TRADE BALANCES WITH THE UNITED STATES, JAPAN, AND THE WORLD

appreciation of the won continued, and it nominally appreciated by 31.3 percent against the U.S. dollar.

Ironically, these market-opening measures by Korea, undertaken in response to U.S. pressures, resulted in little increase in imports from the U.S.[5] The largest beneficiary was not the U.S. but Japan, whose exports to Korea increased rapidly, despite the appreciation of the yen against the won. Figure 1 indicates that trends in Korea's trade balance with Japan sometimes move in the opposite direction to those with the U.S.

[5]Krueger (1993) also argued that U.S. pressure on Korea was unlikely to reduce the U.S. current account deficit.

III. Analytical Framework

A. Measure of Trade Patterns

There are two types of trade patterns. One is inter-industry trade (Heckscher-Ohlin trade: H-O trade hereafter) and the other is intra-industry trade. Balassa's (1965) net export index is used as a measure of inter-industry trade and the Grubel-Lloyd (1975) index is used as a measure of intra-industry trade.

Balassa's net export index is defined as net exports divided by the sum of export and import values for a particular industry,

$$S_{ik} = \frac{(X_{ik} - M_{ik})}{(X_{ik} + M_{ik})}, \tag{1}$$

where X_{ik} and M_{ik} stand for export and import values respectively, while i refers to an industry (SITC 3 digit), and k refers to a country.

Using a weighted average, we can relate the levels of inter-industry trade to the trade shares of each industry. The weighted average of inter-industry trade is defined here as:

$$T_k = \sum_{i=1}^{n} w_{ik} S_{ik}, \tag{2}$$

where $w_{ik} = (X_{ik} + M_{ik}) / \sum_{i=1}^{n} (X_{ik} + M_{ik})$.

The Grubel-Lloyd index is defined as:

$$B_{ik} = 1 - \frac{|X_{ik} - M_{ik}|}{(X_{ik} + M_{ik})}. \tag{3}$$

The index, B_{ik}, takes values from zero to one. The value of the index increases with intra-industry trade. The Grubel-Lloyd index is a biased measure when there is an overall trade imbalance. To overcome this problem, it has been adjusted for the trade imbalance by the method proposed by Aquino (1978).

The Aquino index, which is the trade imbalance adjusted intra-industry trade index, is defined as:

$$Q_{ik} = 1 - \frac{|X^e_{ik} - M^e_{ik}|}{(X^e_{ik} + M^e_{ik})}, \tag{4}$$

where

$$X^e_{ik} = \frac{1}{2} \cdot X_{ik} \cdot \left(\frac{\sum_{i=1}^{n} (X_{ik}+M_{ik})}{\sum_{i=1}^{n} X_{ik}} \right), \quad \text{and}$$

$$M^e_{ik} = \frac{1}{2} \cdot M_{ik} \cdot \left(\frac{\sum_{i=1}^{n} (X_{ik}+M_{ik})}{\sum_{i=1}^{n} M_{ik}} \right).$$

X^e_{ik} and M^e_{ik} are, respectively, adjusted exports and adjusted imports in industry i of country k.

To relate the levels of intra-industry trade to the trade shares of each industry, we used weighted average levels of intra-industry trade. The weighted average of intra-industry trade is defined here as:

$$C_k = \sum_{i=1}^{n} w_{ik} B_{ik}, \tag{5}$$

where $w_{ik} = (X_{ik}+M_{ik}) / \sum_{i=1}^{n} (X_{ik}+M_{ik})$.[6]

B. Decomposition of Total Trade Growth

Total trade is the sum of inter-industry trade (*HOT*) and intra-industry trade (*IIT*).

$$TOT_{ik} = HOT_{ik} + IIT_{ik},$$

$$\text{where } HOT_{ik} = |X_{ik} - M_{ik}| \text{ and} \tag{6}$$

$$IIT_{ik} = (X_{ik}+M_{ik}) - |X_{ik} - M_{ik}|, \text{ and}$$

where *TOT*, *HOT* and *IIT* are total trade, inter-industry trade, and intra-industry trade, respectively, and i and k denote industry and country.

Using equation (6), we can decompose total trade growth into H-O trade growth and intra-industry trade growth. The percentage growth in the total trade of industry i with country k over any period is given by

[6]See Greenaway and Milner (1986, Ch. 5) for a detailed explanation of the various indices of intra-industry trade.

$$\widehat{TOT}_{ik}=(1-B_{ik})\widehat{HOT}_{ik}+(B_{ik})\widehat{IIT}_{ik}\,, \tag{7}$$

where variables with a hat represent the percentage change in each variable over a period in time. Note that B_{ik} is the Grubel-Lloyd intra-industry trade index at the beginning of a period.

To investigate the contribution of *H-O* trade and intra-industry trade to total trade growth in an economy on a product group basis, weighted averages are used. Summary statistics for total trade growth (*GTOT*), *H-O* trade growth (*GHOT*) and intra-industry trade growth (*GIIT*) can be calculated as follows,

$$GTOT_k=GHOT_k+GIIT_k\,,$$

$$\text{where } GTOT_k=\sum_{i=0}^{n} w_{ik}\widehat{TOT}_{ik},$$

$$GHOT_k=\sum_{i=0}^{n} w_{ik}(1-B_{ik})\widehat{HOT}_{ik}\,, \tag{8}$$

$$GIIT_k=\sum_{i=0}^{n} w_{ik}(B_{ik})\widehat{IIT}_{ik}\,,\ \text{and}$$

$$w_{ik}=\frac{(X_{ik}+M_{ik})}{\sum_{i=0}^{n}(X_{ik}+M_{ik})}\,.$$

C. Import and Export Price Elasticities

The trade structure can be examined through import and export elasticities. The size of the import and export price and income elasticities is an important parameter in the assessment of exchange rates and trade policies. The traditional export and import function is a log-linear function of the real exchange rate and of economic activity measured, for example, by gross domestic product. By estimating the export and import function, import and export price and income elasticities have been derived. Recently it was found that to ignore the nonstationarity present in most economic variables results in spurious regressions. Thus, in estimating elasticities, the nonstationarity of variables should be taken into consideration.

To overcome the nonstationarity in economic variables, the difference of the nonstationary variables is often taken. However, differencing the variables creates the problem of information loss.

Cointegration is a useful technique for tackling nonstationary variables, but it requires a large amount of data over a long time span, and so is less suitable for small data sets. Another method, used to measure price and income elasticities, is an autoregressive distributed lag (ARDL) model, as in equation (9). This dynamic model has also proven to be more successful in the estimation stage. Equation (9) resembles the error correction model. Pesaran and Shin (1995) show that this ARDL specification is good and retains the usual interpretation under stationarity, even if the variables are nonstationary. Here the import function is estimated in the following ARDL form.

$$\log(IM)_{t,k} = \alpha_0 + \alpha_1 \log(IM)_{t-1,k} + \alpha_2 \log(RPM)_{t,k} + \alpha_3 \log(KORGDP)_t + \varepsilon_t . \quad (9)$$

IM and *RPM* denote the volume of imports and relative price of imports from each country. *KORGDP* stands for Korea's GDP in terms of the Korean won.

The export volume is assumed to depend on the relative price of exports and the GDP of the trading partner. The export function is estimated in the ARDL form as in equation (10).

$$\log(EX)_{t,k} = \beta_0 + \beta_1 \log(EX)_{t-1,k} + \beta_2 \log(RPX)_{t,k} + \beta_3 \log(TRGDP)_t + \varepsilon_t . \quad (10)$$

EX and *RPX* denote the volume of exports and the relative price of exports, respectively. *TRGDP* stands for the trading partner's GDP.

IV. Empirical Results

A. Commodity Composition and Trade Patterns

Table 2 provides a comparison of Korea's intra-industry trade levels with the U.S. and Japan. The Grubel-Lloyd index (*B*) and Aquino index (*Q*) are calculated at the three-digit level of SITC.[7] The columns of (*B*) in Table 2 show that the levels of Korea's intra-industry trade have increased rapidly in trade with the U.S. and Japan since 1962, and that average levels of Korea's intra-industry trade with Japan became higher than those with the U.S. after 1975, except for 1985. This implies that intra-industry trade has become more important over time, and that Korea's

[7]In computing the Aquino index, the trade imbalance has been corrected using Korea's manufacturing trade imbalance with each country.

TABLE 2

KOREA'S INTRA-INDUSTRY TRADE WITH THE U.S. AND JAPAN

(Manufactured Products)

Year	B		Q/B		C/B	
	USA	Japan	USA	Japan	USA	Japan
1962	10.0	8.5	0.88	0.91	0.18	0.25
1965	14.6	13.2	0.98	1.42	0.35	0.47
1970	19.3	17.7	0.92	1.59	0.81	0.60
1975	26.3	30.5	0.97	1.13	0.88	0.96
1980	27.0	35.5	0.93	1.20	1.00	1.00
1985	34.8	33.3	0.95	1.28	0.86	1.12
1990	33.6	43.1	0.96	1.11	1.09	0.98
1995	38.4	44.5	0.99	1.06	1.27	1.02

Note: For a given year, B is an unweighted average of the Grubel-Lloyd index, and Q is an unweighted average of the Aquino index. C is a weighted average of the Grubel-Lloyd index, with weights given by the trade share of each country.

Source: United Nations, Trade Tapes

intra-industry trade has become a more important component of its trade with Japan than of its trade with the U.S.

The columns of Q/B in Table 2, which are the ratios of the Aquino index to the Grubel-Lloyd index, show that the differences between Korea's intra-industry trade with Japan and with the U.S. are larger than those measured by the Grubel-Lloyd index (B). The values Q/B in trade with Japan are consistently larger than those with the U.S. and, moreover, the values Q/B in trade with Japan are larger than 1.0, which means that intra-industry trade increases if we correct for total trade imbalances.[8] Thus, the results that the values of both B and Q/B with Japan are larger than those with the Unites States imply that Korea's trade patterns with Japan are more intra-industry based than those with the U.S.

In Table 2, the values of Q/B in trade with the U.S. are

[8]We interpret the Grubel-Lloyd index to measure 'flows' of intra-industry trade, and the Aquino index to measure 'patterns' of intra-industry trade.

relatively stable, but those of Q/B in trade with Japan rise and fall over time. In particular, the values of Q/B in trade with Japan are very large in 1965 and 1970. This is because the trade deficits are very large, and most industries were net importers in their trade with Japan in 1965 and 1970. The ratio of the total trade balance to total trade was -91.1% in 1965 and -72.9% in 1970 and the ratio of the number of net import industries to all manufactured industries was 80.4% in 1965 and 83.5% in 1970.[9] These make Q/B increase in 1965 and 1970 in trade with Japan. However, Q/B decreases in trade with Japan after 1970, as the relative size of the trade deficit decreases and the number of net import industries decreases over time.

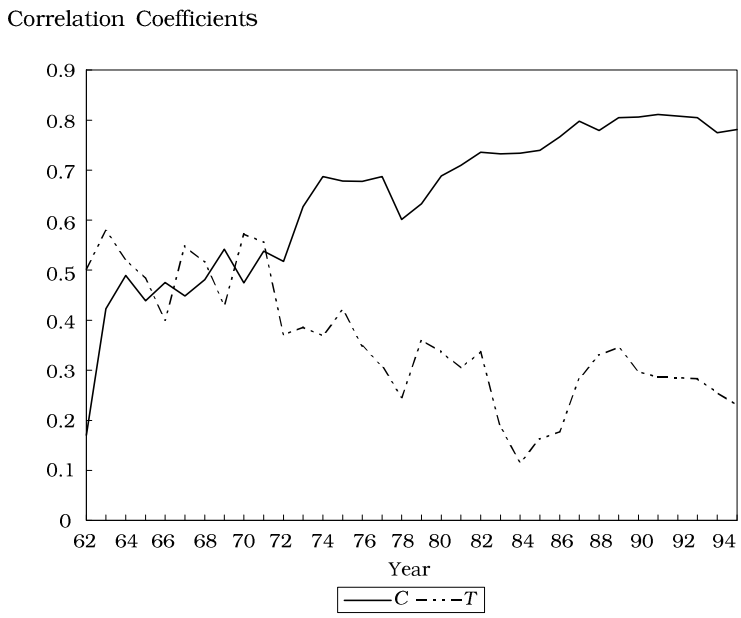
The last columns of C/B, which is the ratio of the weighted average (C) to the simple average (B), show the importance of intra-industry trade to total trade. If industries with high levels of intra-industry trade have larger (smaller) trade shares, then the weighted average will be larger (smaller) than the simple average. That is, the ratio of the weighted average to the simple average is greater (smaller) than 1.0 if the level of intra-industry trade of the dominant industry is high (low).[10]

The ratio of C to B exceeded 1.0 in Korean trade with the U.S. and with Japan from the beginning of 1980. This implies that Korea's levels of intra-industry trade have increased in industries where the trade shares are relatively large. That is, over time intra-industry trade has become more important to Korea.

Many empirical studies on intra-industry trade show that similar preferences and geographical proximity increase intra- industry trade. Thus, the reason that Korea's trade with Japan is more intra-industry intensive than that with the U.S. is partly explained by the fact that Japan is geographically closer than the U.S., and the preferences of Koreans are more similar to those of Japanese than to those of Americans.

[9] Q/B increases if the sign of net exports in each industry is the same as the sign of the total trade balance and if the size of the ratio of net exports to total trade for each industry is similar to that of the ratio of the total trade balance to total trade for manufactured industries. The difference between Q and B increases as the size of the total trade imbalance increases.

[10] Greenaway and Milner (1986) argue that if we want to produce a summary statistic that reflects the relative importance of intra-industry trade at the sub-group level, then the weighted average is a desirable measure.



Note: 1) The values in the graph are correlation coefficients of Korea's trade indices (*C* or *T*) with the U.S. and with Japan. *C* is the weighted Grubel-Lloyd index and *T* is the weighted net-export index.
2) Correlation coefficients are Pearson's rank correlation coefficients.
Source of data: United Nations, Trade Tapes.

FIGURE 2
CORRELATION COEFFICIENT OF TRADE INDICES

B. Korea's Trade Structure with Japan and the U.S.

We used correlation analysis to investigate the similarity between Korea's trade structure with that of the U.S. and that with Japan. Annual net-export indices and G-L indices are computed for Japan and the U.S. at the SITC 3-digit level. These indices are weighted by trade volume. Next, we calculate the annual rank correlation between industrial indices for Japan and for the U.S.

Figure 2 shows variations in the correlation coefficients of net-export indices and intra-industry trade indices. Whereas the correlation coefficients of Korean-Japanese and Korean-American intra-industry trade indices increase, the correlation coefficients of Korean-Japanese and Korean-American inter-industry trade indices

TABLE 3

THE DECOMPOSITION OF TRADE GROWTH

Product Group (SITC)	Country	Decomposition of Trade Growth								
		1965-75			1975-85			1985-95		
		$\hat{TOT}$	$\hat{HOT}$	$\hat{IIT}$	$\hat{TOT}$	$\hat{HOT}$	$\hat{IIT}$	$\hat{TOT}$	$\hat{HOT}$	$\hat{IIT}$
food & raw materials (0-4)	Japan	9.14 (100.0)	7.33 (80.1)	1.82 (19.9)	2.01 (100.0)	1.61 (80.1)	0.40 (19.9)	1.27 (100.0)	0.55 (43.3)	0.72 (56.7)
	USA	8.24 (100.0)	8.14 (98.8)	0.10 (1.2)	1.34 (100.0)	1.06 (79.6)	0.27 (20.4)	1.60 (100.0)	1.53 (95.9)	0.07 (4.1)
manufactured products (5-8)	Japan	19.45 (100.0)	13.50 (69.4)	5.95 (30.6)	2.30 (100.0)	1.37 (59.5)	0.93 (40.5)	3.44 (100.0)	1.79 (51.9)	1.65 (48.1)
	USA	19.01 (100.0)	14.43 (75.9)	4.58 (24.1)	5.69 (100.0)	3.93 (69.1)	1.76 (30.9)	2.26 (100.0)	0.97 (42.7)	1.30 (57.3)
all products (0-9)	Japan	16.51 (100.0)	11.75 (71.2)	4.76 (28.8)	2.25 (100.0)	1.41 (62.7)	0.84 (37.3)	3.09 (100.0)	1.59 (51.4)	1.50 (48.6)
	USA	12.93 (100.0)	10.88 (84.1)	2.05 (15.9)	4.05 (100.0)	2.85 (70.4)	1.20 (29.6)	2.16 (100.0)	1.07 (49.8)	1.08 (50.2)

Note: 1) Figures in parentheses denote the contribution of each component to total trade growth.
2) *TOT*, *HOT* and *IIT* denote the growth rate of total trade, inter-industry trade and intra-industry trade respectively.

decrease. This means that Korea's trade pattern with Japan has become more similar to that with the U.S. in terms of intra-industry trade, and has diverged from it in terms of inter-industry trade. That is, Korea's intra-industry trade pattern with each trading partner has converged, independent of the characteristics of the trading partner, whereas its inter-industry trade pattern with each trading partner has varied depending on the characteristics of the trading partner. This implies that the industries that are net exporters to Japan differ from those that are net exporters to the U.S.

Table 3 provides a measure of how much each pattern of trade contributes to the growth of Korea's trade with the U.S. and with Japan. The results presented in Table 3 are computed by using equation (8) for the periods 1965-75, 1975-85, and 1985-95.

Total trade increased very rapidly from 1965 to 1975, but its growth rate decreased over time. The contribution ratios of trade types show that the contribution of intra-industry trade increased over time, both in Korea's trade with Japan and in Korea's trade with the U.S. During the periods 1965-75 and 1975-85, the growth of total trade was largely due to increase in inter-industry trade. However, in the period 1985-95, the contribution of intra-industry trade to total trade growth was over 50% for Korea's trade with the U.S., and up to almost 50% in Korea's trade with Japan.

As a whole, the contribution of intra-industry trade to the growth of total trade has become larger over time. In particular, the contribution of intra-industry trade to the growth of total trade is more important in the manufacturing sector than in the agricultural sector.

C. Import and Export Price Elasticities of Korean-Japanese and Korean-American Trade

The differences in trade patterns can be examined by comparing import and export price elasticities. It has been said that imports from Japan increase as Korean exports to the world increase, because the imports from Japan are composed of intermediate and capital goods. This trade structure implies that the price and income elasticities of import from Japan are relatively low. Here we investigate the import and export elasticities of Korean-Japanese and Korean-American trade. Comparisons are made between the magnitude of the import and export elasticities.

Data are analyzed on a quarterly basis, from the first quarter of 1988 to the third quarter of 1997. Note that the Bank of Korea has only computed the unit value of imports and exports between Korea and each of its trading partners since 1988. The sources of data of bilateral trade volumes are UN trade tapes. Other variables are taken from the International Monetary Fund CD-ROM. Gross Domestic Products are measured in terms of domestic currency and in real terms. Export and import volumes (quantities) are calculated by the total value of exports and imports divided by their unit values. Data are seasonally adjusted by the X-11 ARIMA method. The relative price is the exchange rate-adjusted whole price index ratio.

TABLE 4

INCOME AND PRICE ELASTICITIES OF EXPORTS TO JAPAN AND TO THE U.S.

	lagged export	relative price	real GDP	long run price elasticity	long run income elasticity	
Export to Japan	0.94*** (0.08)	-0.16* (0.08)	0.11 (0.08)	-2.6 (3.4)	1.83 (1.44)	R^2=0.86 h=1.87
Export to U.S.	0.77*** (0.11)	-0.22** (0.07)	0.28** (0.14)	-1.0*** (0.34)	1.20*** (0.13)	R^2=0.86 h=1.18

Notes: 1) Numbers in parentheses refer to the standard error of the regression.
2) ***, ** and * denote 1 percent, 5 percent and 10 percent significance levels, respectively.
3) h denotes the Durbin statistic under the presence of lagged dependent variables.

Table 4 shows the results of estimation of the Japanese and the U.S. export functions (equation 10). The columns labeled lagged export, relative price and GDP give the coefficient of lagged export, the short term price elasticity, and the short term income elasticity, respectively. The long-term price and income elasticities are defined as the short-term elasticity minus the coefficient estimate of the lagged dependent variable. Variances and t-statistics are computed using delta methods.[11] We can see that the short-run price and income elasticities for exports to Japan are lower than those to the U.S. It should be noted that the long-run elasticity of exports to Japan is larger than that to the U.S. However, these relative differences should be interpreted with caution, since the long-run coefficients for exports to Japan are not significant. In general, we observe that the long-run price and income elasticities are larger than the short-run elasticities. It is worthwhile to check whether there are differences between the price and income elasticities of exports to Japan and those to the U.S. The null hypothesis that the short-run price and income elasticities of exports to the U.S. are higher than those to Japan cannot be rejected at the one percent

[11]The variance of the long-term price elasticity of imports (E_p) is calculated as follows:

$$Var(E_p)=\{1/(1-\alpha_1)\}^2 Var(\alpha_2)+\{\alpha_2/(1-\alpha_1)\}^2 Var(\alpha_1)$$
$$+2\{1/(1-\alpha_1)\}\{\alpha_2/(1-\alpha_2)^2\}cov(\alpha_1,\ \alpha_2).$$

The variance of long term income elasticity is obtained by substituting α_2 by α_3.

TABLE 5

INCOME AND PRICE ELASTICITIES OF IMPORTS FROM JAPAN AND THE U.S.

	lagged import	relative price	real GDP	long run price elasticity	long run income elasticity	
Import from Japan	0.71*** (0.11)	0.04 (0.08)	0.26** (0.12)	0.13 (0.27)	0.9* (0.51)	R^2=0.92 h=1.09
Import from U.S.	0.55*** (0.14)	-0.24* (0.13)	0.58*** (0.21)	-0.53*** (0.17)	1.32* (0.90)	R^2=0.93 h=-0.11

Notes: The same as in Table 4.

significance level.[12]

Table 5 shows the price and income elasticities of imports from the U.S. and Japan. The price and income elasticities of U.S. imports are much larger than those for Japanese imports, both in the short-run as well as in the long run. The short-run price elasticity of Japanese imports appears to be positive, which is not supported by economic logic, but the statistic is not significant. This positive and insignificant price elasticity seems to be related to the Korea's import structure. Korea imports intermediate goods and capital goods from Japan. This implies that exchange-rate policy has little effect on Japanese imports.

Other empirical results have the expected signs and are significant. It is shown that the short-run and long-run price and income elasticities of imports from Japan are lower than those from the U.S. The null hypothesis that the short-run and long-run elasticities of Japanese imports are lower than those of U.S. imports cannot be rejected at the 5 percent significance level. We can safely say that the price and income elasticities of Japanese imports are lower than those of U.S. imports. These facts are consistent with the generally accepted opinion that there are differences in import structure between Japanese and U.S. imports.

The empirical results regarding price and income elasticities show that there is a significant difference in the magnitude of elasticities between trade with Japan and trade with the U.S. More specifically, imports from and exports to the Unites States are more elastic than imports from and exports to Japan.

[12]The t-values of the respective tests are 2.97 and 5.55.

V. Conclusion

For the past 30 years, trade growth has contributed significantly to Korea's high economic growth. The U.S. and Japan have been Korea's most important trading partners, even if their share of total trade has decreased from 70% to 50%. Korea's trade volume and trade patterns have changed rapidly. This paper examined how Korea's bilateral trade patterns and trade volumes with the U.S. and Japan have changed over the past 30 years.

This research showed that levels of Korea's intra-industry trade have increased rapidly in trade with the U.S. and Japan since 1962. After 1975, with the exception of 1985, the average level of Korea's intra-industry trade with Japan became higher than that with the U.S. The analysis of correlation coefficients indicates that Korea's trade pattern with Japan has become similar to that with the U.S. in terms of intra-industry trade, and has diverged from it in terms of inter-industry trade. The price and income elasticities of imports from the U.S. are higher than those from Japan, both in the long-run and in the short-run. Also the short-run price and income elasticities of exports to the U.S. are higher than those to Japan.

It has been found that there are major differences in the pattern and structure of trade between Korea and Japan and trade between Korea and the U.S. Trade imbalance between countries can cause trade frictions and disputes. Governments sometimes use trade policy and exchange-rate policy to specifically target trade imbalances with a specific country. The existence of the differences specified above in trade patterns and trade structures with respect to a trading partner should be taken into consideration when trade policies or exchange rate policies are formulated.

(Received March, 1999; Revised September, 1999)

References

Aquino, A. "Intra-Industry Trade and Inter-Industry Specialization as Concurrent Sources of International Trade in Manufactures." *Weltwirtschaftliches Archiv* 114 (1978): 275-96.

Balassa, Bela. "Trade Liberalization and "Revealed" Comparative

Advantage." *Manchester School* 33 (1965): 99-123.

Greenaway, D., and Milner, C. R. *The Economics of Intra-Industry Trade*. New York: Basil Blackwell, 1986.

Grubel, H., and Lloyd, P. *Intra-Industry Trade*. London: Macmillan, 1975.

Helpman, E. "International Trade in the Presence of Product Differentiation, Economies of Scale and Monopolistic Competition." *Journal of International Economics* 11 (1981): 305-40.

_____, and Krugman, P. R. *Market Structure and Foreign Trade: Increasing Returns, Imperfect Competition and the International Economy*. Brighton: Wheatsheaf Books, 1985.

Kim, Taegi. "Intra-Industry Trade: The Korean Experience." *International Economic Journal* 6 (1992): 95-113.

Kim, Taeho, and Kim, Eishik. "The External Transaction Model for Korean Economy." *Economic Analysis* 4 (No. 3 1998), Bank of Korea (in Korean).

Krueger, A. O. *Economic Policies at Cross-Purposes: The United States and Developing Countries*. Washington, D.C.: The Brookings Institution, 1993.

Lee, Hwan Ho. "The Effect of Yen-Dollar Exchange Rate on the Regional exports and Imports in Korea." *Kukje Kyungje Yonku* 1 (No. 2, 1995), The Korea International Economic Association (in Korean).

Lee, Jisoon. "An Economic Analysis of the Korean Trade Policies: 1960-1990." *Journal of Asian Economics* 3 (1992): 335-55.

Nam, Chong-Hyun. "Protectionist U.S. Trade Policy and Korean Exports." In T. Ito and A. O. Krueger (eds.), *Trade and Protectionism*. Chicago: University of Chicago Press, 1993.

Pesaran, H., and Shin, Y. "An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis." Discussion Paper 95-14. Cambridge University, Department of Applied Economics, 1995.

Senhadji, Abdelhak, and Montenegro, Claudio. "Time Series Analysis of Export Demand Equations: A Cross-Country Analysis." IMF Working Paper WP/98/149, 1998.