Development of Intra-Industry Trade between Korea and Japan: the Case of Automobile Parts Industry

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Abstract

This paper focuses on trade patterns of the automobile parts industries between Korea and Japan and examines the trends of intra-industry trade (IIT), which can be further divided into horizontal IIT (HIIT) and vertical IIT (VIIT). By comparison with the cases of other intra-regional IIT, this paper investigates the regional-specific factors of IIT to capture the main determinants of the IIT patterns between Korea and Japan. According to the econometric investigation, the decreasing differences in market size and transportation costs are major sources of IIT for Korea and Japan, suggesting that the Korea-Japan FTA could contribute to IIT growth between them.

JEL Classification: F14

Keywords: Intra-industry trade; Korea and Japan; Automobile parts industry

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I. Introduction

Korea established the Import Source Diversification Program (ISDP) in 1978 as a way to diversify the sources of imports for goods that Korea was running a trade deficit from a single source country. Effectively, the program reduced imports of certain goods, including automobile, from Japan. The number of goods covered by the ISDP had been falling since the early 1980s, and there had been no items added to the list of goods covered by ISDP since 1993. In the Uruguay Round (UR) negotiations, Korea agreed to eliminate the program in stages from June 1996 to the end of 1999. About 75% of trading items are removed from the ISDP list on December 31, 1998 and June 30, 1999. For example, the automobile parts (HS 8708) and tires for passenger cars (HS 4011) were removed from the ISDP list on June 30, 1999[1]. However, Korea's average MFN tariff rates for automobile parts are still 8%, which is high compared to Japan (0%)[2].

Figure 1a-1b illustrate the long-run trends in motor vehicles exports of Korea and Japan from 1985 to 2001. The data for Figure 1 come from Statistics Canada (2001). The commodity classification is based on the SITC revision 2 and SITC code 78 is correspond to road vehicles. According this Figure 1a, the value of exports of road vehicles from Korea has been increasing from 1,010 million US dollars in 1985 to 16,696 million US dollars in 2001. However, the share of auto vehicle exports to Japan from Korea relative from total exporters has decreased from 5.70 % to 1.88 %.

[1] See Nam and Yang (2003).

[2] MFN tariff rates of the automobile industry can be examined using the UNCTAD TRAINS website (http://r0.unctad.org/trains/). The database contains the average MFN tariff rates and range of the MFN tariff rates up to HS 6 digit commodity classification.

To understand whether auto vehicles in each country have comparative advantage, revealed comparative advantage (RCA) indices for auto vehicle exports are calculated. RCA indices above (below) unity indicate the presence of comparative advantage (disadvantage) in the world trade. Figure 1a shows that RCA indices for Korean auto vehicles are increasing and became more than unity in 1996-1997 and 2000-2001. It means that Korea has comparative advantage in auto vehicle sectors in recent years.

According this Figure 1b, the value of exports of road vehicles from Japan has been also increasing from 45,500 million US dollars in 1985 to 88,300 million US dollars in 2001. The share of auto vehicle exports to Korea from Japan relative from total exporters has decreased, but still high (31.73 % in 2001). RCA indices for Japanese auto vehicles has been stably high and kept more than 200% since 1985.

INSERT FIGURE 1a-1b

According this Figure 2a, the value of exports of road vehicle parts from Korea has been increasing from 98 million US dollars in 1985 to 2,031 million US dollars in 2001. Moreover, the share of auto vehicle exports to Japan from Korea relative from total exporters has been quite small but has increased from 1.35 % to 5.30 %. RCA indices for Korean auto vehicle parts are increasing but still less than unity. It means that Korea has not comparative advantage in auto vehicle parts sectors yet.

According this Figure 2b, the value of exports of road vehicle parts from Japan has been also increasing from 5,470 million US dollars in 1985 to 16,840 million US dollars in 2001. The share of auto vehicle parts exports to Korea from Japan relative from total exporters has decreased, but still high (46.17 % in 2001). RCA indices for Japanese auto vehicle parts has been stably high and kept more than 120% since 1985.

INSERT FIGURE 2a-2b

Table 1a-1c summarizes auto vehicle exports of Korea and Japan by commodities in recent years. They reported the share of automobile parts exports from Korea to Japan (or the opposite direction) is much higher than that of exports to the world. Hence, we can expect that the two-way trade or intra-industry trade (IIT) of automobile parts is rising recently.

INSERT TABLE 1a-1c

Our Objectives of this paper are, first, to investigate the recent change in trade patterns of automobile parts in Korea and Japan, and compared these patterns with those in other region. Second, we establish whether the bilateral trade of automobile parts between Korea and Japan is of an “inter-industry (OWT),” “vertical intra-industry (VIIT),” or “horizontal intra-industry (HIIT)” nature. Finally, we analyzed the determinants of automobile parts IIT for Korea and Japan using econometric analysis based on the theoretical foundation. The remainder of the paper is organized as follows. In Section 2 we provide an overview of automobile parts trade patterns in Korea and Japan and present a descriptive analysis. In section 3 we conduct an econometric analysis of the determinants of IIT in automobile parts for Korea and Japan. Section 4 summarizes the main findings of this paper.

II. Overview of Intra-Industry Trade in the Automobile Parts Industry

First of all our measurement methods for IIT and data for the later analysis are explained before our investigation. Traditionally, IIT is measured as Grubel-Lloyed index.

The simplest method sums the export and import values over commodities that comprise an industry and calculates the Grubel-Lloyed index using these values. Our method takes a weighted average of the simple Grubel-Lloyed index for each commodity within the industry.[3]

In recent years, many studies analyze IIT by distinguishing between horizontal and vertical IIT using a methodology employed by Abd-el-Rahman (1991), Greenaway et al. (1994, 1995), Fontagné et al. (1997) and so on. That is because the Grubel-Lloyed index cannot measure the IIT of differentiated products even though theory suggests determinants of IIT are different between IIT where goods are vertically differentiated (differentiated by quality) and IIT where goods are horizontally differentiated (differentiated by attributes). In order to distinguish the two types of IIT, the methodology is based on the assumption that the gap between the unit value of imports and the unit value of exports for each commodity reveals the qualitative differences of the products exported and imported between the two economies. We break down the bilateral trade flows of each detailed commodity category into the three types: "One-Way Trade" (OWT) "Horizontal Intra-Industry Trade" (HIIT) and "Vertical Intra-Industry Trade" (VIIT) as described in Appendix 2. For our analysis, we chose to identify horizontal IIT mainly by using the range of relative export/import unit values of 1/1.25 (i.e., 0.8) to 1.25. Although most previous studies mainly use a 15% threshold to distinguish between horizontally and vertically differentiated products, we employ a 25% threshold to avoid the noise coming from the exchange rate fluctuations and the aggregation of different commodities.[4]

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[3] The definition of GL index is as follows:

$$GL_{kk'} = 100\left(1 - \frac{\sum_j \left|M_{kk'j} - M_{k'kj}\right|}{\sum_j M_{kk'j} + \sum_j M_{k'kj}}\right)$$

[4] In order to test the sensitivity of our results to the range of relative export/import unit values chosen, we also calculate the measures using a 1/1.15 (approx. 0.87) to 1.15 range (a 15% threshold). The result was consistent with the categorization under the 25% threshold.

For the analysis of trade patterns in automobile parts industry we used the PC-TAS (Personal Computer Trade Analysis System) published by the United Nations Statistical Division. This dataset provides us with bilateral trade data of almost all the countries at the 6-digit HS88 commodity classification for the years 1996 to 2001.[5] For the calculation of the IIT measures, we used the importing countries' data. Regarding the PC-TAS data several impediments should be mentioned. First, because of the lack of data on trade volumes, we were unable to decide the trade patterns (OWT, VIIT, and HIIT) for some commodities. Therefore the coverage of commodities used for our analysis of trade types is not whole[6]. Second, in the compilation process of the PC-TAS, trade data of less than 50,000 US dollars are excluded.[7] Third, trade data for Taiwan are not included in the PC-TAS.

INSERT Figure 3

Then, Figure 3 shows that the shares of the three trade types (OWT, VIIT, and HIIT) and the Grubel-Lloyd index in Korea and Japan, and in the other area for automobile parts trade. Compared between trade types in Korea-Japan and the other regions, Figure 3 shows that the share of IIT and the Grubel-Lloyd index are much higher in the EU and NAFTA comparing trade between Korea and Japan. Especially, the share of HIIT in Korea and Japan is quite low. However, the share of vertical IIT between Korea and Japan has been growing compared with other regions and increased by 7.0 in 1996-2001.

[5] In order to obtain the data for 1996-2001, we extracted the data for 1996 from the PC-TAS for 1996-2000 and combined them with the PC-TAS data for 1997-2001, both of which are based on the HS88 6-digit standard.

[6] The whole import data from the PC-TAS are used for the Grubel-Lloyd indices because we do not need the trade volume data to calculate them.

[7] When there is at least one year during 1997-2001 in which the trade value of a certain commodity exceeds the cut-off level of 50,000 US dollars, the trade values of this commodity for the other years are reported in PC-TAS, even if the trade values of the other years are less than this cut-off level. In this sense, the cut-off threshold is applied in an irregular manner.

III. An Econometric Analysis of the Determinants of Intra-Industry Trade

The model and variables

In this section, we investigate determinants of IIT by conducting some regression analyses. A number of studies have empirically tested for country or industry specific influences on IIT and some of them distinguish between horizontal and vertical IIT. Greenaway, Hine and Milner (1994) focuses on whether the pattern of IIT was related to country-specific factors examining the trade of the UK with 62 countries in the year 1988. Durkin and Krygier (2000) examines US bilateral IIT with 20 OECD trading partners for the years 1989-1992. Fontagné, Freudenberg and Péridy (1997) tested intra-EC vertical and horizontal IIT for the period 1980-1994. Hu and Ma (1999) studies on bilateral trade of China with 45 countries using the vertical and horizontal IIT index.

In order to capture determinants of detailed types of IIT, we develop three kinds of index for IIT as a dependent variable for the regression analysis for Japan and Korea.

DIIOWT: comparative differences between IIT and OWT.

DHVIIT: comparative differences between horizontal IIT and vertical IIT.

DHLVIIT: comparative differences between high-quality vertical IIT and low-quality vertical IIT.

Each index is defined as following:

$$1+(\tau-0.5)\left(1+\frac{[\tau\ln\tau+(1-\tau)\ln(1-\tau)]}{\ln 2}\right)$$

where $\tau \equiv IIT_{ij}$ for DIIOWT;

$$\tau \equiv \frac{HIIT_{ij}}{IIT_{ij}} \text{ for DHVIIT}$$

$$\tau \equiv \frac{HQVIIT_{ij}}{VIIT_{ij}} \text{ for DHLVIIT}$$

IIT_{ij} : the share of IIT (equals to the total share of HIIT and VIIT) between country i and j,

$HIIT_{ij}$: the share of HIIT between country i and j,

$VIIT_{ij}$: the share of VIIT between country i and j,

and $HQVIIT_{ij}$: the share of high-quality VIIT from country i to country j.

Following to most of previous studies, we estimate:

$$DIIT_{ijt} = \alpha_0 + \sum_m \alpha_m Z_{mijt} + \alpha_d DIST_{ij} + \varepsilon_{ijt}$$

where $DIIT_{ijt}$ stands for DIIOWT, DHVIIT, or DHLIIT, while $DIST_{ij}$ represents the geographic distance and ε_{ijt} is the error term. The subscript *i* and *j* denote countries *i* (Korea or Japan) and *j* (a trade partner), respectively, while subscript *t* denotes year *t* (1996-2001).[8] As for other explanatory variables, Z_{mijt}, we include variables representing market size, difference in per capita income, and so on:[9]

Average market size (GDP)

As employed in most previous studies, we include the average GDP in logarithm (the simple average of the GDP value in international dollar of the two economies) as an indicator of the size of two economies trading each other. The main hypotheses state that larger countries are expected to produce and consume a greater variety of goods. We, therefore, expect that the bilateral volume of intra-industry trade is positively related to the market size.

Absolute difference in market size (DGDP)

We include the variable representing the difference in market size between the trading partners. The difference is traditionally considered as an obstacle to intra-industry trade in similar products. Therefore, it is expected that the bigger the difference is, the lower the share

[8] Totally, 64 countries are included in our regression analysis.
[9] The GDP data and per capita GDP data are taken from World Bank (2003). Some variables representing foreign direct investment or global production network should be included in our econometric model, because they should have a large impact on the level of IIT. However, it is difficult to find the Korean FDI data for automobile-related industry before 2001. Therefore, we had to give up including the FDI variable this time.

of horizontal intra-industry is. Following to Balassa (1986), Balassa and Bauwens (1987), and other studies, we calculate the difference as:

$$DGDP_{ij} = 1 + \frac{[w \ln w + (1-w)\ln(1-w)]}{\ln 2}$$

$$\text{where} \quad w \equiv \frac{GDP_i}{GDP_i + GDP_j}$$

This measure of DGDPij takes a value between 0 and 1, which is independent of the absolute size of the trade partners.

Comparative difference in market size (DGDP2)

The comparative difference in GDP of two trade partners is defined as $DGDP2_{ij} = 1 + (w - 0.5)DGDP_{ij}$. DGDP2 takes a value between 0.5 and 1.5, and the country with higher (lower) GDP obtains more (less) than unity.

Average standard of living (GDPPC)

Income per capita or standard of living (GDPPC) expressed as an average of two trade partners is positively associated with the intra-industry trade, especially horizontal IIT. Helpman and Krugman (1985) explains that income per capita represents a proxy of level of the capital-labor ratio and the differentiated good is assumed to be capital-intensive in production.

Absolute economic distance (DGDPPC)

The economic distance is represented by the difference in GDP per capita as indicated by Fontagné, Freudenberg, and Péridy (1997). This variable is measured in a similar way as the variable *DGDP*. The economic distance may influence the trade pattern through both demand and supply side. A lower difference in economic distance implies that demand structure become more similar in the two trading countries, resulting in greater mutual trade in differentiated products. In this way, the potential for horizontal intra-industry trade increases (Linder Hypothesis). On the other hand, if we consider that differences in per capita income are also associated with the difference in capital-labor endowment of the trading partners, economic distance should then be positively associated with the vertical differentiation of products and vertical intra-industry trade.

Comparative economic distance (DGDPPC2)

The comparative difference in GDP per capita of two trade partners is measured in a similar way as the variable *DGDP2.* Similarly, *DGDPPC2* takes a value between 0.5 and 1.5, and the country with higher (lower) income level obtains more (less) than unity.

Geographic Distance (DIST)

The variable DIST is the distance between the capital cities of the trading partners in logarithm[10]. The distance between countries should lead to a reduction in two-way trade subject to transportation costs. Therefore, it is expected that this variable have a negative impact on IIT.

Results of Estimation

Left-hand side of Table 2 presents the pooled regression results for the determinants of IIT measured by the comparative difference in IIT and OWT (DIIOWT) for Korea and Japan. The estimated coefficients on the variables representing absolute difference in market size (DGDP) and geographical distance (DIST) are strongly significant and have expected signs for both Korea and Japan. Therefore, the Korea-Japan free trade agreement (FTA), which could reduce the transaction costs, and convergence of market size as a result of FTA could increase IIT between Korea and Japan.

INSERT TABLE 2

The estimation results for the determinants of HIIT and VIIT (DHVIIT) are shown in right-hand sides of Table 2. Korea and Japan has coefficient estimates for comparative

[10] The distance data are taken from Haveman (2003). For countries of which distance data are not available, the distance is calculated on the web page, [http://www.indo.com/distance/index.html].

deference in market size (DGDP2) with the opposite sign. It means that the convergence in GDP between Korea and Japan (decrease in the level of DGDP2 for Japan and increase in that for Korea) makes the share of the horizontal IIT increase on the trade between Korea and Japan.

INSERT TABLES 3

Finally, the results for the determinant of high-quality vertical IIT using a panel regression with fixed effects are reported in Table 3. Compared to OLS estimation with pooling, the estimation with fixed effects eliminates unobservable country specific components. In this case, every coefficient estimate yields significant for Japan. On the other hand, the coefficient estimates for Korea are not significant at the 5% level. When only market size (GDP) and comparative difference in per capita income (DGDPPC2) are used as repressors, the coefficient estimates are in the right sign with improved significance for Korea. Interestingly, Korea and Japan has coefficient estimates for comparative deference in per capita income (DGDPPC2) with the opposite sign. However, if the Korea-Japan FTA causes the convergence in living standard between Korea and Japan, the level of DGDPPC2 for higher income country (Japan) would decrease and that for lower income country (Korea) would increase. Then, the share of high-quality VIIT tends to increase on the trade between Korea and Japan. It means that Korea-Japan FTA induces more competition in high-quality automobile parts industry in both countries.

IV. Conclusions

First of all, we found that Japan’s share of automobile parts exports to Korea comparing total exports of automobile parts to Korea has been quite large (30%-60%) since 1985. The share seemed to be declined around 1997, but it revived again thereafter. Bilateral trade of automobile parts between Korea and Japan is rapidly growing since 1999. Actually, most of automobile related trade between Korea and Japan are trade of automobile parts.

As for the trade types, share of intra-industry trade and Grubel-Lloyed index for Korea and Japan are lower compared with those for NAFTA, EU, and MERCOSUR. However, those are higher than IIT among Northeast Asian countries (Japan, Korea, and China) and East Asia. Moreover, despite low level of horizontal IIT, vertical IIT has rapidly increased between Korea and Japan. Main automobile parts classified as vertical IIT between Korea and Japan is engine parts (32.4% of total vertical IIT in 2001).

It is surprising that share of IIT between Japan and Korea is higher than the average share of IIT for each country. Additionally, we found that most of vertical IIT between Japan and Korea is that Japan exports high-quality products instead of low-quality products from Korea. We analyzed the determinants of automobile parts IIT for Korea and Japan using econometric analysis based on the theoretical foundation. In conclusion, decreasing difference in market size and transportation costs are major sources of IIT growth for both Japan and Korea. Therefore, a free trade agreement (FTA), which could reduce the transaction costs, and convergence of market size as a result of FTA could increase IIT between Korea and Japan.

Finally, a significantly positive (negative) impact of comparative economic distance on high-quality vertical IIT for Korea (Japan) is suggesting that the convergence of per capita income between Korea and Japan induces more competition in high-quality automobile parts industry in both countries.

Appendix 1. List of Automotive Related Products at HS 6-digit Level

INSERT APPENDIX TABLE 1

Appendix 2. Methodologies for Categorization of Trade Types

We break down the bilateral trade flows of each detailed commodity category into the three patterns: (a) *inter*-industry trade (one-way trade), (b) *intra*-industry trade (IIT) in horizontally differentiated products (products differentiated by attributes), and (c) IIT in vertically differentiated products (products differentiated by quality).

$M_{kk'j}$: value of economy k's imports of product j from economy k'

$M_{k'kj}$: value of economy k''s imports of product j from economy k

$UV_{kk'j}$: average unit value of economy k's imports of product j from economy k'

$UV_{k'kj}$: average unit value of economy k''s imports of product j from economy k.

Then the *share* of each trade type is defined as:

$$\frac{\sum_j (M^Z_{kk'j} + M^Z_{k'kj})}{\sum_j (M_{kk'j} + M_{k'kj})} \qquad \text{(A 2.1)}$$

where *Z* denotes one of the three trade types, i.e., "One-Way Trade" (OWT) "Horizontal Intra-Industry Trade" (HIIT) and "Vertical Intra-Industry Trade" (VIIT) as in Appendix Table 2.

Appendix Table 2. Categorization of trade types

Type	Degree of trade overlap	Disparity of unit value
"One-Way Trade" (OWT)	$\frac{Min(M_{kk'j}, M_{k'kj})}{Max(M_{kk'j}, M_{k'kj})} \leq 0.1$	Not applicable
"Horizontal Intra-Industry Trade" (HIIT)	$\frac{Min(M_{kk'j}, M_{k'kj})}{Max(M_{kk'j}, M_{k'kj})} > 0.1$	$\frac{1}{1.25} \leq \frac{UV_{kk'j}}{UV_{k'kj}} \leq 1.25$
"Vertical Intra-Industry Trade" (VIIT)	$\frac{Min(M_{kk'j}, M_{k'kj})}{Max(M_{kk'j}, M_{k'kj})} > 0.1$	$\frac{UV_{kk'j}}{UV_{k'kj}} < \frac{1}{1.25}$ or $1.25 < \frac{UV_{kk'j}}{UV_{k'kj}}$

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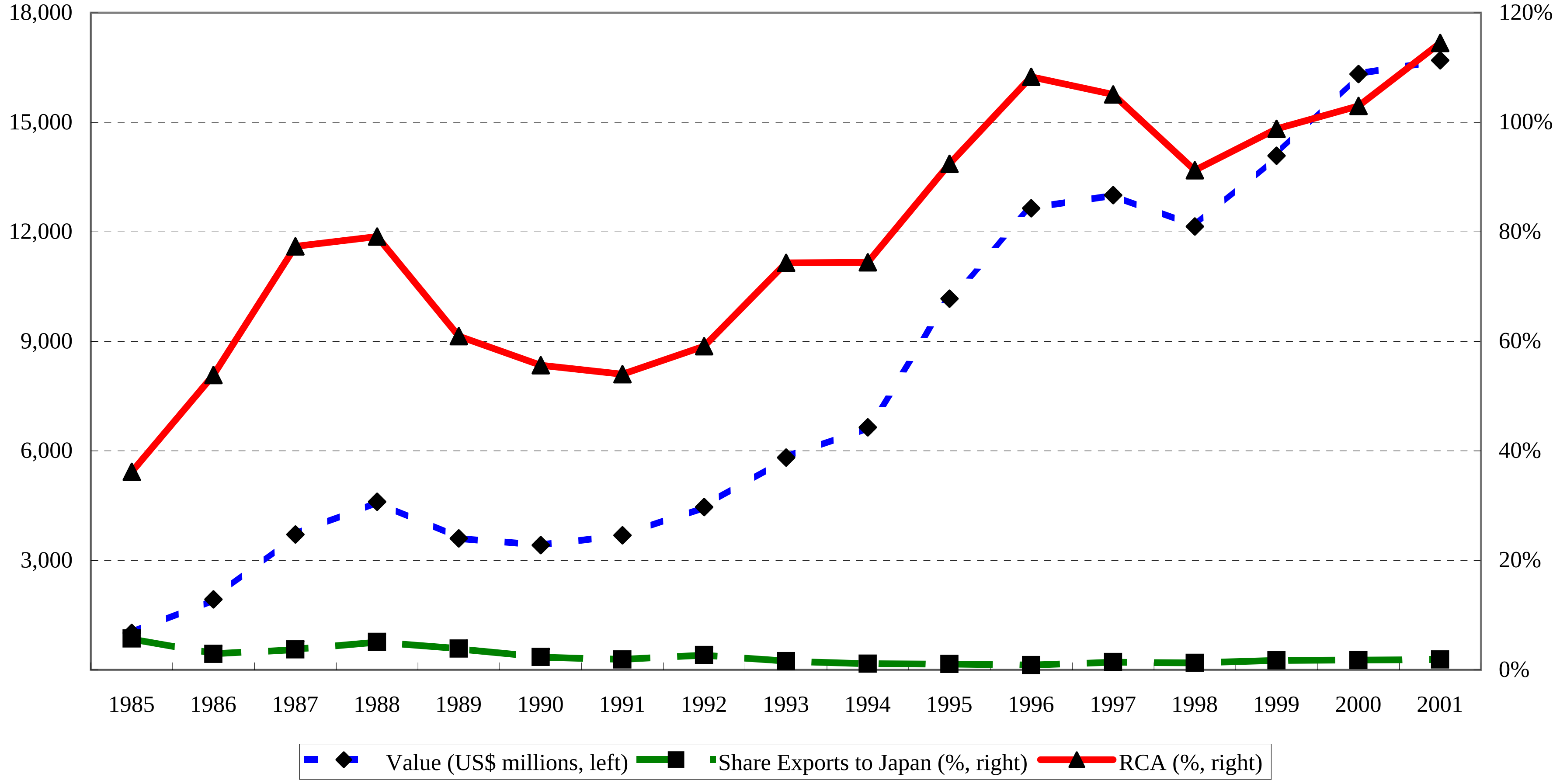
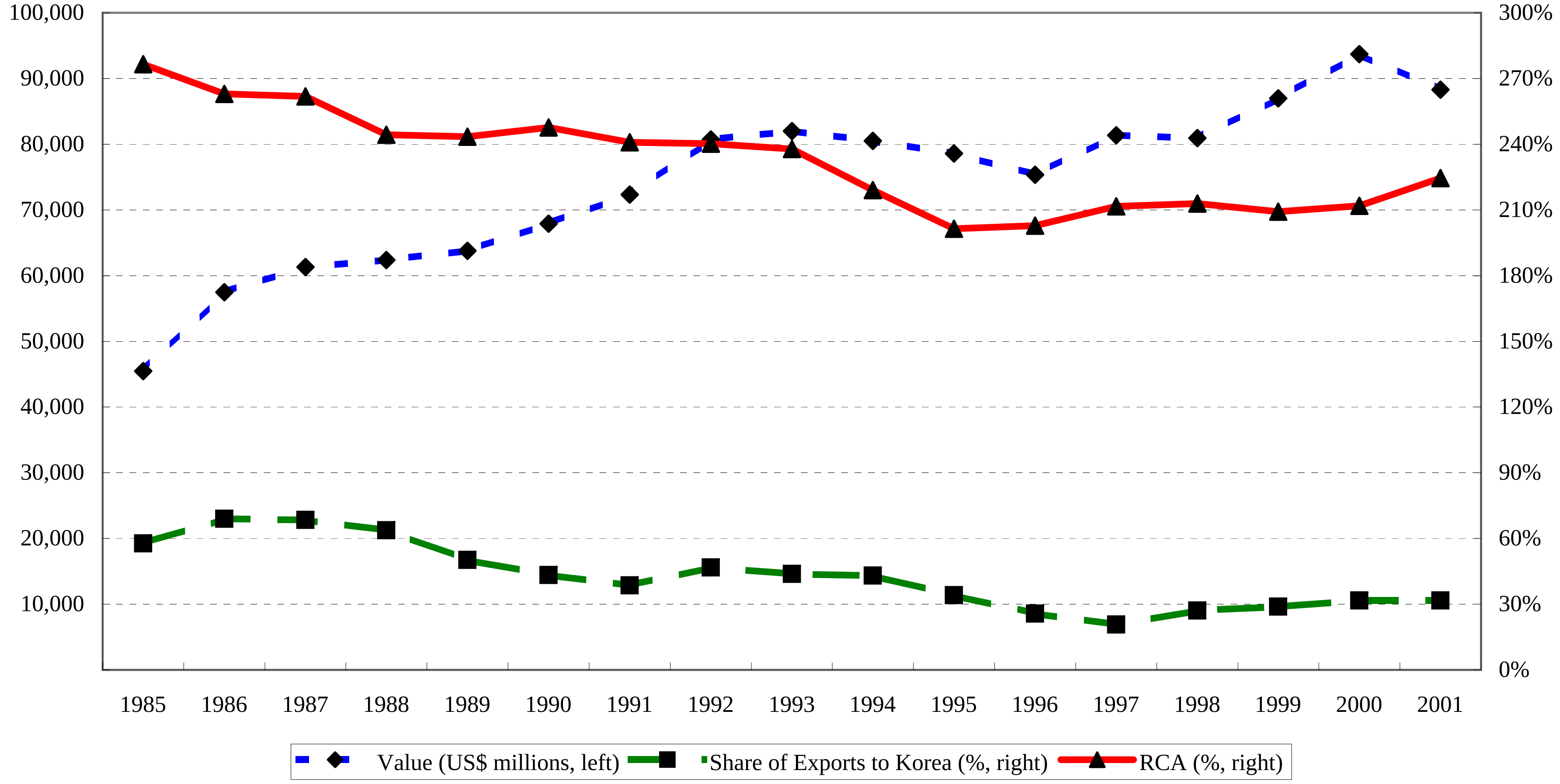
Figure 1a: Long-term Trends in Korean Exports of Road Vehicles (SITC-based)



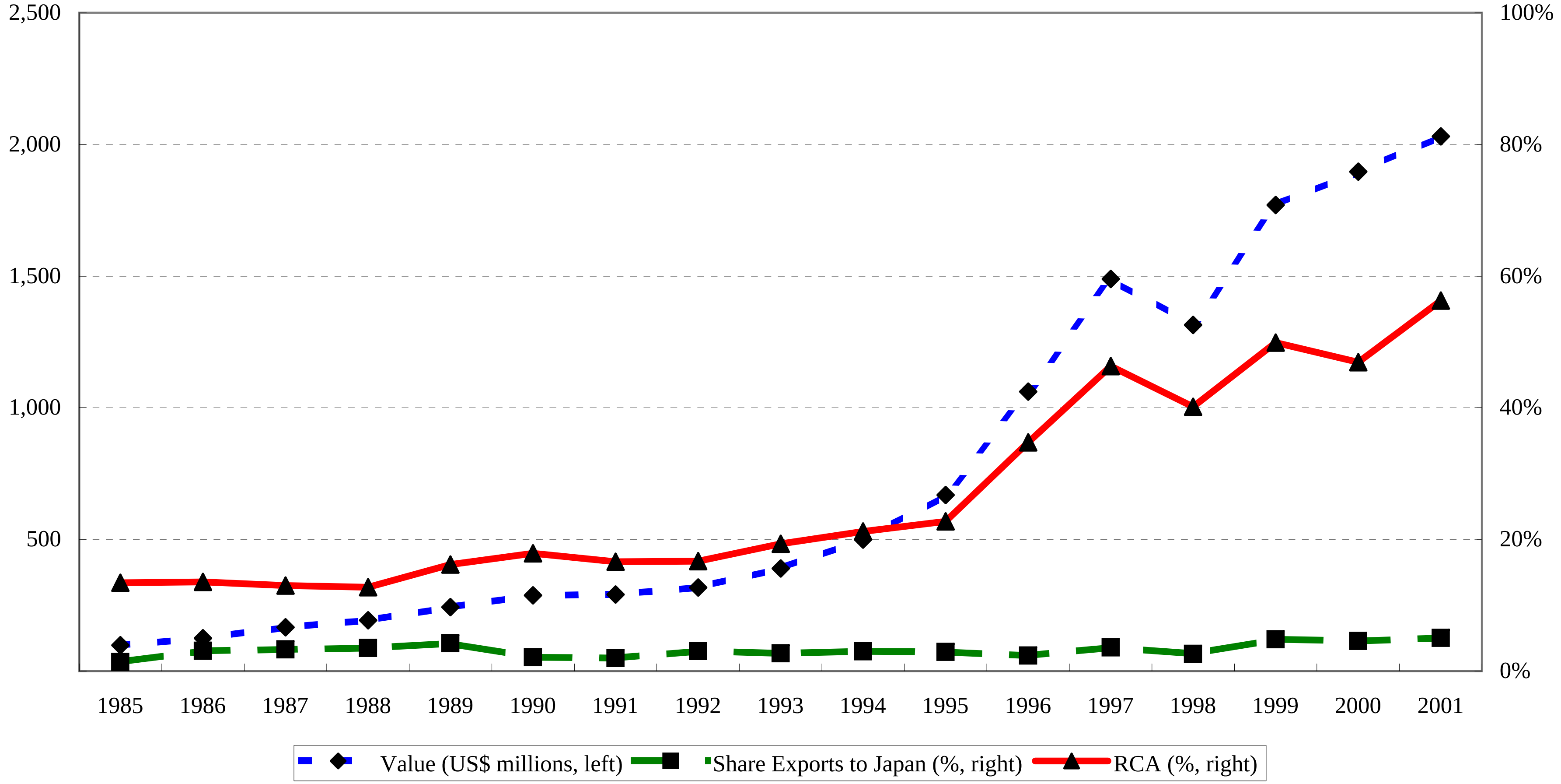
Source: Statistics Canada (2003).

Figure 1b: Long-term Trends in Japanese Exports of Road Vehicles (SITC-based)



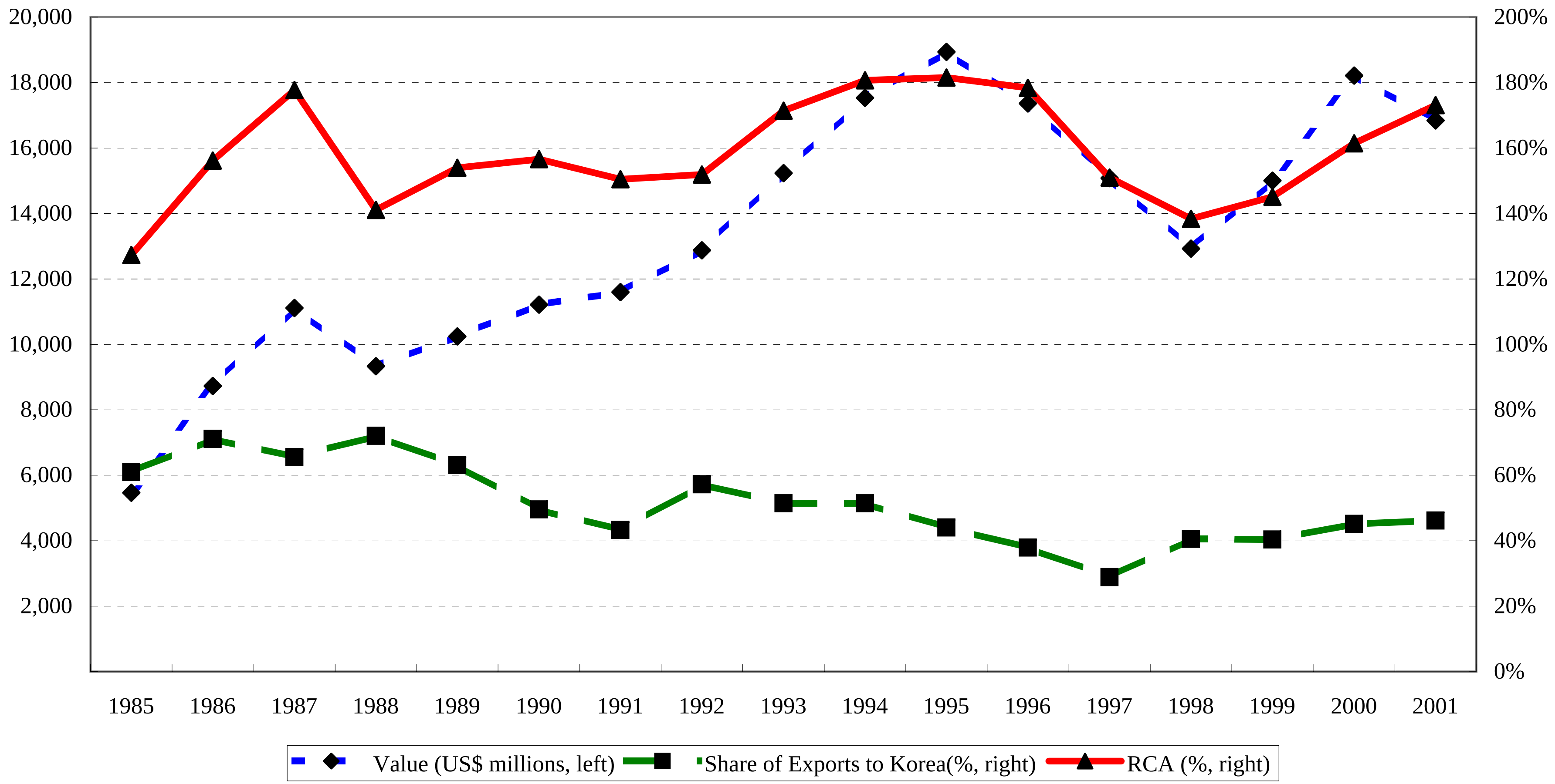
Source: Statistics Canada (2003).

Figure 2a: Long-term Trends in Korean Exports of Road Vehicle Parts (SITC-based)



Source: Statistics Canada (2003).

Figure 2b: Long-term Trends in Japanese Exports of Road Vehicle Parts (SITC-based)



Source: Statistics Canada (2003).

Figure 3: Evolution of the Share of Trade Types and the GL indicators in automobile parts trade, 1996-2001

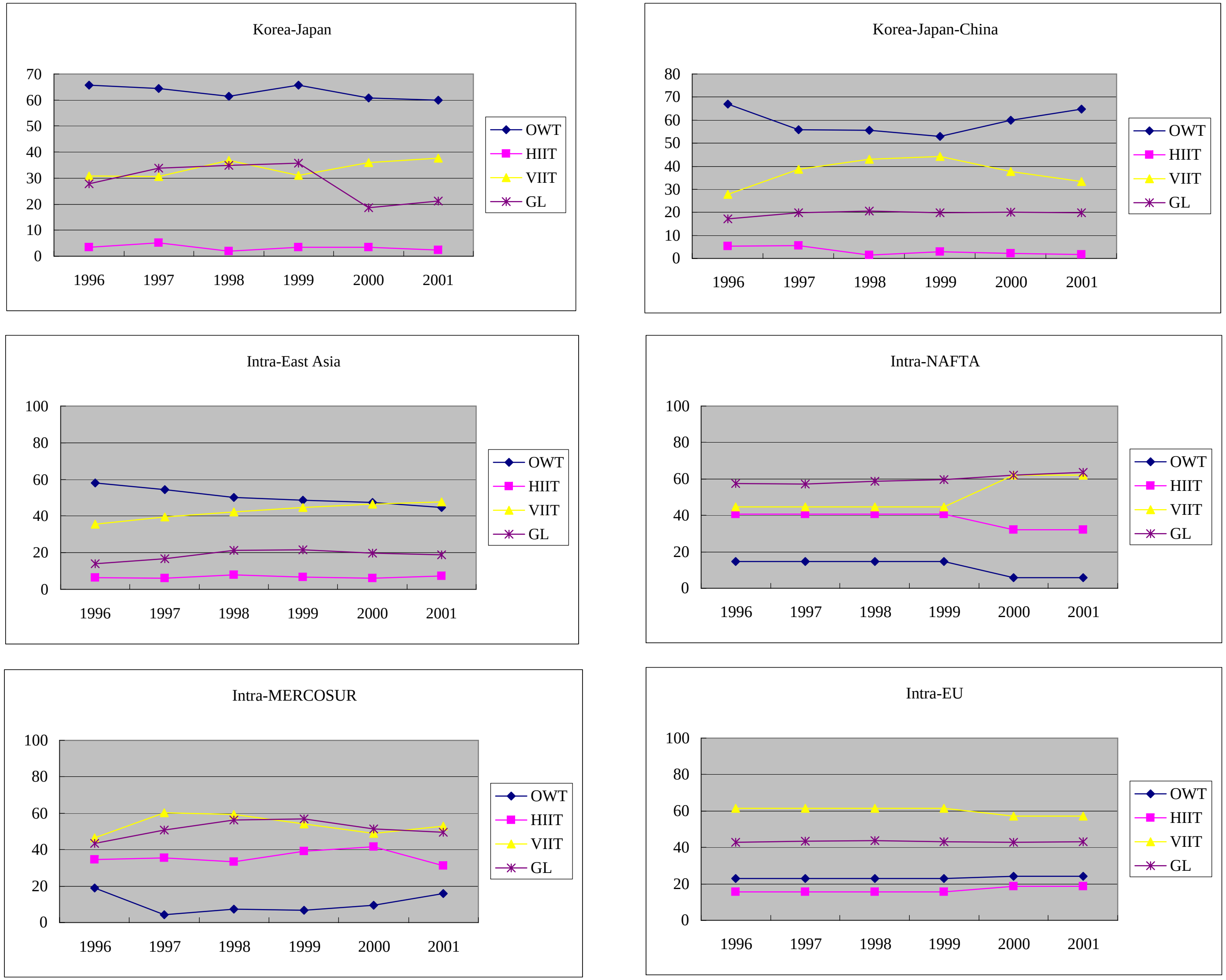


Table 1a: Korean Road Vehicle Exports by Commodity (US$ millions)

	1996	1997	1998	1999	2000	2001
from KOREA to WORLD						
Road vehicles	12,640	13,005	12,144	14,087	16,320	16,696
Passenger motor cars	9,289	9,443	8,819	10,453	12,570	13,094
Motor vehicles for transport of goods	1,055	973	1,009	1,011	1,005	863
Road motor vehicles, n.e.s.	476	588	572	383	486	557
Parts & accessories	1,061	1,489	1,314	1,770	1,896	2,031
Motorcycles motor scooters, etc.	41	38	38	56	75	76
Trailers & other vehicles	718	474	391	415	287	74
from KOREA to JAPAN						
Road vehicles	124	170	114	168	196	193
Passenger motor cars	7	5	4	4	8	19
Motor vehicles for transport of goods	2	0	1	1	1	2
Road motor vehicles, n.e.s.	0	0	0	0	0	0
Parts & accessories	54	97	64	115	134	146
Motorcycles, motor scooters, etc.	20	18	18	18	19	11
Trailers & other vehicles	40	49	27	29	34	15
from KOREA to CHINA						
Road vehicles	168	81	92	128	177	227
Passenger motor cars	40	20	22	24	50	109
Motor vehicles for transport of goods	77	18	26	19	14	19
Road motor vehicles, n.e.s.	8	14	10	18	36	38
Parts & accessories	21	14	22	50	72	59
Motorcycles, motor scooters, etc.	4	1	1	2	1	0
Trailers & other vehicles	17	14	11	16	5	2

Sources: Statistics Canada (2003).

Table 1b: Japanese Road Vehicle Exports by Commodity (US$ millions)

	1996	1997	1998	1999	2000	2001
from JAPAN to WORLD						
Road vehicles	75,351	81,361	80,918	86,976	93,690	88,295
Passenger motor cars	41,134	49,027	52,230	57,612	60,311	57,660
Motor vehicles for transport of goods	14,083	14,430	13,539	12,098	12,580	11,295
Road motor vehicles, n.e.s.	1,037	1,095	939	846	1,018	996
Parts & accessories	17,356	15,080	12,928	15,004	18,212	16,840
Motorcycles, motor scooters, etc.	1,630	1,614	1,221	1,350	1,525	1,454
Trailers & other vehicles	109	116	61	64	44	50
from JAPAN to KOREA						
Road vehicles	632	471	328	477	652	686
Passenger motor cars	4	4	1	2	8	37
Motor vehicles for transport of goods	42	35	4	17	42	48
Road motor vehicles, n.e.s.	0	0	0	0	0	0
Parts & accessories	579	424	318	450	592	596
Motorcycles, motor scooters, etc.	5	5	3	7	8	4
Trailers & other vehicles	3	3	2	1	2	1
from JAPAN to CHINA						
Road vehicles	517	591	678	786	1,258	1,445
Passenger motor cars	66	179	341	266	451	456
Motor vehicles for transport of goods	165	157	137	112	122	103
Road motor vehicles, n.e.s.	16	55	52	34	54	42
Parts & accessories	215	165	114	326	585	792
Motorcycles, motor scooters, etc.	51	31	29	45	43	43
Trailers & other vehicles	4	4	6	3	3	8

Sources: Statistics Canada (2003).

Table 1c: Share of Parts & Accessories Export in Korea and Japan (%)

	1996	1997	1998	1999	2000	2001
from KOREA to WORLD						
Road vehicles	100.0	100.0	100.0	100.0	100.0	100.0
Passenger motor cars	73.5	72.6	72.6	74.2	77.0	78.4
Parts & accessories	8.4	11.4	10.8	12.6	11.6	12.2
from KOREA to JAPAN						
Road vehicles	100.0	100.0	100.0	100.0	100.0	100.0
Passenger motor cars	5.7	2.9	3.7	2.6	4.2	9.6
Parts & accessories	43.9	57.4	56.0	68.5	68.3	75.6
from JAPAN to WORLD						
Road vehicles	100.0	100.0	100.0	100.0	100.0	100.0
Passenger motor cars	54.6	60.3	64.5	66.2	64.4	65.3
Parts & accessories	23.0	18.5	16.0	17.3	19.4	19.1
from JAPAN to KOREA						
Road vehicles	100.0	100.0	100.0	100.0	100.0	100.0
Passenger motor cars	0.6	0.9	0.3	0.4	1.3	5.4
Parts & accessories	91.6	90.0	96.9	94.4	90.8	86.8

Sources: Statistics Canada (2003).

Table 2. Results for Intra-Industry Trade in Japan and Korea

Pooled Regression

	Japan DIIOWT	Korea DIIOWT	Japan DHVIIT	Korea DHVIIT
GDP	-0.096	0.234	-0.246	0.325
	(-2.14)	(8.85)	(-2.38)	(2.60)
DGDP	-0.242	-0.217		
	(-9.13)	(-5.03)		
DGDP2			-0.324	0.768
			(-3.00)	(2.02)
GDPPC	0.780	0.021	1.563	0.111
	(4.56)	(0.29)	(5.54)	(0.86)
DGDPPC	0.195	-0.205		
	(2.20)	(-1.91)		
DGDPPC2			0.671	0.035
			(4.11)	(0.15)
DIST	-0.135	-0.082		
	(-8.62)	(-4.02)		
N	258	216	258	216
adj R2	0.992	0.989	0.901	0.688
F value	6237.471	3953.220	588.425	119.608
Prob>F	0.000	0.000	0.000	0.000

Note: The values in parentheses are t-ratios.

Table 3. Results for High-quality VIIT and Low-quality VIIT in Japan and Korea

Panel Regression: Fixed Effects

	Japan DHLVIIT	Korea DHVIIT	Japan DHLVIIT	Korea DHVIIT
GDP	-2.866	-0.135	-0.712	-0.130
	(-3.89)	(-0.83)	(-3.46)	(-2.13)
DGDP2	3.132	-0.130		
	(2.83)	(-0.30)		
GDPPC	2.752	-0.453		
	(3.35)	(0.25)		
DGDPPC2	-7.601	1.726	-5.006	3.454
	(-4.10)	(1.15)	(-3.79)	(5.58)
N	258	216	258	216
adj R2	0.997	0.557	0.996	0.551
F value	2021.696	7.943	1385.160	8.128
Prob>F	0.000	0.000	0.000	0.000

Note: The values in parentheses are t-ratios.

Appendix Table 1: List of Automotive Related Products at HS 6-digit Level

Rubber Parts	401110	Pneumatic tire new of rubber f motor car incl station wagons&racg cars
	401120	Pneumatic tires new of rubber for buses or lorries
	401140	Pneumatic tires new of rubber for motorcycles
	401220	Pneumatic tires used
	401290	Solid o cushiond tires,interchangeable tire treads&tire flaps of rbr
	401310	Inner tubes of rubber for motor cars etc buses or lorries
Glass Parts	700711	Safety glass toughend (tempered) f vehicles,aircraft,spacecraft/vessel
	700721	Safety glass laminated for vehicles, aircraft, spacecraft or vessels
	700910	Rear-view mirrors for vehicles
Metal Parts	830120	Locks of a kind used for motor vehicles of base metal
	830230	Mountings,fittings&similar articles of base metal f motor vehicles,nes
Engines	840731	Engines, spark-ignition reciprocating, displacing not more than 50 cc
	840732	Engines,spark-ignition reciprocating,displacg >50 cc but nt more 250cc
	840733	Engines, spark-ignition reciprocating displacing > 250 cc to 1000 cc
	840734	Engines, spark-ignition reciprocating displacing more than 1000 cc
	840790	Engines, spark-ignition type nes
	840820	Engines, diesel, for the vehicles of Chapter 87
Engine Parts	840991	Parts for spark-ignition type engines nes
	840999	Parts for diesel and semi-diesel engines
	841330	Fuel, lubricating or cooling medium pumps for int comb piston engines
	842123	Oil or petrol-filters for internal combustion engines
	842131	Intake air filters for internal combustion engines
	842542	Jacks & hoists nes hydraulic
Machinary Parts (TRANSMISSION S	848310	Transmission shafts and cranks, including cam shafts and crank shafts
	848320	Bearing housings, incorporating ball or roller bearings
	848330	Bearg housings,not incorporatg ball/roller bearings;plain shaft beargs
	848340	Gears&gearing,ball screws,gear boxes,speed changers/torque converters
	848350	Flywheels and pulleys, including pulley blocks
	848360	Clutches and shaft couplings (including universal joints)
	848390	Parts of power transmission equipment/oth goods usd to transmit power
Electric Parts	850710	Lead-acid electric accumulators of a kind usd f startg piston engines
	850720	Lead-acid electric accumulators nes
	850730	Nickel-cadmium electric accumulators
	850740	Nickel-iron electric accumultors
	850780	Electric accumulators, nes
	851210	Lighting or signalling equipment of a kind used on bicycles
	851220	Lighting or visual signalling equipment nes
	851230	Sound signalling equipment
	851240	Windscreen wipes, defrosters and demisters
	851290	Parts of electrical lighting, signalling and defrosting equipment
	851829	Loudspeakers, nes
	852721	Radio rece nt capabl of op w/o ext source of power f motor veh,combind
	852729	Radio rece nt capable of op w/o ext source of power f motor vehicl,nes
	853921	Filament lamps, tungsten halogen
	853929	Filament lamps, excluding ultraviolet or infra-red lamps, nes
	854430	Ignition wirg sets&oth wirg sets usd in vehicles,aircraft etc
Automobiles	870210	Diesel powered buses with a seating capacity of > nine persons
	870290	Buses with a seating capacity of more than nine persons nes
	870310	Snowmobiles, golf cars and similar vehicles
	870321	Automobiles w reciprocatg piston engine displacg not more than 1000 cc
	870322	Automobiles w reciprocatg piston engine displacg > 1000 cc to 1500 cc
	870323	Automobiles w reciprocatg piston engine displacg > 1500 cc to 3000 cc
	870324	Automobiles with reciprocating piston engine displacing > 3000 cc
	870331	Automobiles with diesel engine displacing not more than 1500 cc
	870332	Automobiles with diesel engine displacing more than 1500 cc to 2500 cc

Appendix Table 1: (continued)

Automobiles	870333	Automobiles with diesel engine displacing more than 2500 cc
	870390	Automobiles nes including gas turbine powered
	870410	Dump trucks designed for off-highway use
	870421	Diesel powered trucks with a GVW not exceeding five tonnes
	870422	Diesel powerd trucks w a GVW exc five tonnes but not exc twenty tonnes
	870423	Diesel powered trucks with a GVW exceeding twenty tonnes
	870431	Gas powered trucks with a GVW not exceeding five tonnes
	870432	Gas powered trucks with a GVW exceeding five tonnes
	870490	Trucks nes
	870510	Mobile cranes
	870520	Mobile drilling derricks
	870530	Fire fighting vehicles
	870540	Mobile concrete mixers
	870590	Special purpose motor vehicles nes
Chasssis fitted with E	870600	Chassis fittd w engines for the vehicles of headg Nos 87.01 to 87.05
Vehicle Bodies	870710	Bodies for passenger carrying vehicles
	870790	Bodies for tractors, buses, trucks and special purpose vehicles
Vehicle Parts	870810	Bumpers and parts for motor vehicles
	870821	Safety seat belts for motor vehicles
	870829	Parts and accessories of bodies nes for motor vehicles
	870831	Mounted brake linings for motor vehicles
	870839	Brake system parts nes for motor vehicles
Transmissions	870840	Tansmissions for motor vehicles
Vehicle Parts	870850	Drive axles with differential for motor vehicles
	870860	Non-driving axles and parts for motor vehicles
	870870	Wheels including parts and accessories for motor vehicles
	870880	Shock absorbers for motor vehicles
	870891	Radiators for motor vehicles
	870892	Mufflers and exhaust pipes for motor vehicles
	870893	Clutches and parts for motor vehicles
	870894	Steering wheels,steering columns and steering boxes for motor vehicles
	870899	Motor vehicle parts nes
Motorcycles	871110	Motorcycles with reciprocating piston engine displacing 50 cc or less
	871120	Motorcycles with reciprocatg piston engine displacg > 50 cc to 250 cc
	871130	Motorcycles with reciprocatg piston engine displacg > 250 cc to 500 cc
	871140	Motorcycles with reciprocatg piston engine displacg > 500 cc to 800 cc
	871150	Motorcycles with reciprocatg piston engine displacg more than 800 cc
	871190	Motorcycles with other than a reciprocating piston engine
Mortorcycle Parts	871419	Motorcycle parts nes
Trailers	871620	Trailers for agricultural purposes
	871631	Tanker trailers and semi-trailers
	871639	Trailers nes for the transport of goods
	871640	Trailers and semi-trailers nes
	871680	Wheelbarrows, hand-carts, rickshaws and other hand propelled vehicles
	871690	Trailer and other vehicle parts nes
Clocks	910400	Instrument panel clocks&clocks of a sim type for vehicles,aircraft,etc
Seats	940120	Seats, motor vehicles
	940190	Parts of seats other than those of heading No 94.02