Intra-Industry Trade in the ASEAN Region: The Case of the Automotive Industry

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ABSTRACT

We investigated recent trends and patterns of intra-regional trade, focusing on the automobile and automobile parts industries in the ASEAN-4 countries. Looking at the intra-ASEAN auto parts trade in detail, we found that although the Grubel-Lloyd intra-industry trade (IIT) index showed a steady trend in the ASEAN region and other regions, the level of the index is considerably lower in ASEAN than in NAFTA and MERCOSUR. On the other hand, vertical IIT showed a rapid increase while horizontal IIT remained at a very low level in ASEAN, which is one of the conspicuous characteristics for the region. Moreover, we found that Thailand was the largest exporter and importer of automobile parts in ASEAN and that engines and engine parts were the major components traded among the ASEAN-4 countries. Most intra-industry trade in the region, however, was concentrated in miscellaneous automobile parts.

Our econometric investigation on the determinants of IIT revealed that for the AFTA countries, increasing market size, the decreasing difference in market size, and the increasing size of the automotive industry were major sources of IIT growth. However, the estimated coefficients on the AFTA dummy were not significant in many of the equations, suggesting that the regional FTA has not contributed to IIT growth in the AFTA countries.

JEL classification: F14; L62

Keywords: Intra-industry trade; Intra-regional trade; Automotive industry; ASEAN.

1. Introduction

Automobile production in the ASEAN-4 countries (Indonesia, Malaysia, the Philippines and Thailand) reached 1.4 million units in 2002, which was almost the same level as the peak before the Asian crisis in 1997 (Figure 1b).[1] Although the production volume in the ASEAN-4 countries is still much smaller than in other Asian countries like Korea and China (Figure 1a), the ASEAN region has seen a rapid recovery of their automobile industry and has grown into an export base for the world's leading automobile manufacturers since 1998.

A series of deregulation measures in the past few years has led to conspicuous changes in the business environment for the ASEAN automobile industry: the Asian Industrial Cooperative (AICO) scheme was implemented in 1996, minimizing tariff dissimilarities and offering qualified participating companies the immediate benefit of the CEPT (Common Effective Preferential Tariff) tariff rates in the range of zero to five percent;[2] in 1998, the AFTA (ASEAN Free Trade Agreement) was introduced, as a result of which the CEPT applied to more than 96 percent of all the manufacturing and agricultural products by 2002; Indonesia lowered tariff rates on CBU (Complete Built-Up) and CKD (Complete Knock-Down) parts produced in ASEAN to 5 percent in January 2002, followed by Thailand and the Philippines where the tariff rates were lowered in January 2004;[3] moreover, the local content requirements were lifted or mitigated in the late 1990s in the ASEAN-4 countries.[4]

INSERT FIGURE 1

As liberalization proceeded, the world's leading automobile manufacturers have sought to streamline production and procurement networks in the ASEAN region in order to enhance their competitiveness in the world market. In the business strategies of the leading automobile manufacturers, Thailand has taken a key position as a regional production and export hub, while production in the other ASEAN countries has been geared to the supply of parts and components to global markets as well as the regional market, utilizing the AICO and AFTA

[1] ASEAN stands for the Association of South East Asian Nations.

[2] As of April 2002, 90 cases were approved under the AICO scheme, 82 of which are related to the automotive industry and 67 of which are related to brand-to-brand complementation applied by major automobile manufacturers.

[3] Malaysia will lower the tariff rates to 20 percent in January 2005 and further to 5 percent in January 2008.

[4] Thailand lifted its local content requirement in January 2000; Malaysia partially reduced the LMDI (Localization of Mandatory Deletion Items) in January 2002 and was supposed to completely lift the LMDI in January 2004; Indonesia abolished its incentive program of lower import duties and luxury taxes based on the extent of local content achieved in July 1999; and the Philippines gradually reduced the local content requirements beginning in July 2002 and completely lifted it in July 2003.

schemes.[5] Moreover, in order to reduce the risks incurred by an excessive concentration on China, the ASEAN region is seen as a strategically very important base of automobile production particularly for Japanese automobile manufacturers aided by the agglomeration of parts suppliers (both foreign-affiliated and local) and support from local governments.

Although it is likely that these dynamics have led to substantial changes in trade relationships and production networks in the ASEAN region, very few studies have investigated these developments quantitatively.[6] The purpose of this paper thus is to examine the volumes and patterns of trade in automobiles and automobile parts in the period from 1996 to 2001, focusing on intra-regional trade trends in the ASEAN-4 countries. The remainder of the paper is organized as follows. Section 2 provides an overview of exports and intra-industry trade in the automobile and automobile parts industries, using the United Nations' trade data at the HS88 (Harmonized Commodity Description and Coding System Revised in 1988) 6-digit level. The analysis concentrates primarily on the ASEAN-4 countries, though some other regions such as the EU (European Union), NAFTA (North American Free Trade Agreement), and MERCOSUR (Mercado Común del Sur; The Common Market of the South) are also investigated for comparison. In section 3, using the same database, we conduct an econometric analysis of the determinants of intra-industry trade for the case of automotive industry. Section 4 summarizes the main findings of this paper and concludes.

2. Patterns and development of automotive trade in the ASEAN region

2.1 Overview of Automotive Trade from 1996 to 2001

Table 1 shows the trends in automotive exports from major East Asian countries from 1996 to 2001. Panel (a) of Table 1 indicates that Thailand rapidly increased its automobile exports in current U.S. dollar during the period and consequently dominates automobile exports by the ASEAN-4 countries. As for automobile parts exports, while all ASEAN-4 country saw a rise in the value of their exports in terms of current U.S. dollar during the period, the increase was greater for Thailand and Indonesia than for Malaysia and the Philippines. As a result of the surge, exports from the ASEAN-4 surpassed those from Korea in 2001. As most ASEAN

[5] For example, in 2002, more than half of the units produced by the Auto Alliance Thailand (Ford-Mazda), which started operations in May 1998, were exported. Isuzu and Mitsubishi also regard Thailand as a production and export base for their one-ton pick-up trucks. Toyota launched the IMV (Innovative International Multipurpose Vehicle) project and will start producing the IMV models in Thailand and Indonesia in 2004. The IMV models are supposed to achieve a high local content (approximately 90 percent) and to be exported to a world market. For the business strategies of major automobile manufacturers, see FOURIN (2002), Takayasu (2002), Mori (2002), etc.

[6] Aswicahyono and Anas (2000) analyze the pattern of ASEAN automotive exports and assess their competitiveness in their destination markets, using trade data for the period from 1991 to 1996.

currencies experienced a large depreciation due to the 1997 Asian Crisis, evaluating the export values in terms of current U.S. dollar is quite misleading. Panel (b) of Table 1 thus shows a standardized index representing real values of automotive exports from the ASEAN-4 countries. The index is obtained by converting the value in US dollars to local currencies and then deflating these using the producer or wholesale price index for transport equipment of each country. According to the roughly constructed index, exports of automobiles from Thailand had grown fourteen-fold in 2001 when compared with 1996 and those from Indonesia fourfold in real terms, while those from Malaysia and the Philippines had fallen almost by half. Turning to exports of automobile parts, all ASEAN-4 country experienced an increase in real terms: Thailand's rose almost threefold, Malaysia's 50 percent, those of the Philippines more than twofold, and Indonesia's tenfold.

INSERT TABLE 1

Next, let us look at the share of the different destinations of automotive exports from the ASEAN-4 countries. As shown in Table 2, 60 percent of automobile exports from the ASEAN-4 countries were destined for European countries, consisting mostly of exports by Malaysia's national car manufacturer, Proton. Proton had gradually increased exports during the first half of 1990s and the major destinations were the U.K. and Singapore. Thailand also started exporting in the early 1990s, and MMC Sittipol (an affiliate of Mitsubishi Motors) was a major exporter of one-ton pick-up trucks to more than 100 countries except North America in 1996 (FOURIN 1996). Following the Asian crisis, manufacturers rapidly increased their automobile exports from ASEAN (including CBUs and CKDs), led by Thailand. While the volume of exports to all destinations increased, the largest rise was in exports to Australia, which consequently saw its share in ASEAN car exports expand.

Looking at exports of automobile parts, the share of intra-ASEAN-4 exports (i.e. exports from one of the ASEAN-4 countries to other ASEAN-4 countries) registered an above-average increase, reaching a share of 14 percent in 2001. Overall, however, there was no dramatic change in the shares of the major export destinations during the period from 1996 to 2001: the EU, Japan, and NAFTA each accounted for about 20 percent, while other East Asian countries (i.e. excluding the ASEAN-4 and Japan) accounted for 15 percent. These figures suggest that the ASEAN-4 countries serve as automobile parts suppliers to the global market, though the regional market has gradually increased in importance in automobile parts transactions.

INSERT TABLE 2

2.2 Measurement of intra-industry trade (IIT) and description of data

In order to investigate trade patterns in automobile parts in the ASEAN-4 countries more closely, we rely on two approaches to measure intra-industry trade. What follows is a brief description of these measures and the data that we use. Traditionally, IIT is measured using the Grubel-Lloyd index. We apply two methods to compute an aggregate Grubel-Lloyd index. The first simply sums the export and import value of all commodities in a particular industry and calculates the Grubel-Lloyd index using these values (GL1). The second method takes a weighted average of the index GL1 for each commodity within the industry (GL2).[7]

In recent years, many studies analyzing IIT have distinguished between horizontal and vertical IIT using the methodology employed by Abd-el-Rahman (1991), Greenaway et al. (1994, 1995), Fontagné et al. (1997), etc..[8] The reason is that the Grubel-Lloyd index cannot measure IIT in differentiated products even though theory suggests that the determinants of IIT are different in the case of goods that are vertically differentiated (differentiated by quality) and goods that are horizontally differentiated (differentiated by attributes). Empirically, horizontal and vertical IIT are commonly distinguished by assuming that the gap between the unit value of imports and the unit value of exports of each commodity reveals the qualitative differences of the products that two countries trade in. Following this approach, we break down the bilateral trade flows in 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, such as Abd-el-Rahman (1991), Greenaway, Hine, and Milner (1994), and Fontagné, Freudenberg, and Péridy (1997), generally use a 15% threshold to distinguish between horizontally and vertically differentiated products, we employ a 25% threshold for the

[7] The major difference between GL1 and GL2 is that the former sums trade imbalances at the commodity level. Trade imbalances with opposite signs tend to cancel each other out when calculating GL1. This is not the case for GL2. Therefore, when computed for the same industry, GL2 never surpass GL1. The definitions of GL1 and GL2 are as follows:

$$GL1_{kk'} = 100\left(1 - \frac{\left|\sum_j M_{kk'j} - \sum_j M_{k'kj}\right|}{\sum_j M_{kk'j} + \sum_j M_{k'kj}}\right), \quad GL2_{kk'} = 100\left(1 - \frac{\sum_j \left|M_{kk'j} - M_{k'kj}\right|}{\sum_j M_{kk'j} + \sum_j M_{k'kj}}\right)$$

[8] The number of studies on IIT is increasingly rapidly. Examples are Aturupane et al. (1999), who analyze the determinants of vertical and horizontal IIT between the EU and Central and Eastern European economies, Hu and Ma (1999), who focus on China, and Durkin and Krygier (2000), who examine US bilateral trade with OECD countries. Montout et al. (2003) investigate horizontal and vertical IIT in NAFTA and MERCOSUR focusing on the automobile industry during the period from 1992 to 1999.

following reasons. First, the values recorded in trade statistics are often affected by exchange rate fluctuations. Second, as we rely on import statistics at the HS88 6-digit level in our analysis, our measurements of unit values are likely to include more noise, caused by the aggregation of different commodities, than the measurements by Fontagné, Freudenberg, and Péridy (1997) who used the classification of the 8-digit "Combined Nomenclature (CN)."[9]

For the analysis of trade patterns in the automobile 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 for almost all the countries at the 6-digit HS88 commodity classification for the years 1996 to 2001.[10] For the calculation of the IIT measures, we used the importing countries' data. Regarding the PC-TAS data, several limitations 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 complete.[11] Second, in the compilation process of the PC-TAS, trade data of less than 50,000 US dollars are excluded.[12] Third, trade data for Taiwan are not included in the PC-TAS.

2.3 Overview of Intra-Industry Trade in the Automobile Parts Industry

In this section, we investigate intra-industry trade (IIT) in automobile parts industry, focusing on the ASEAN-4 countries. First, we give an overview of the patterns of trade types in the ASEAN-4 and compare them with those in other major trade blocs such as the EU, NAFTA, and MERCOSUR. Figure 2 shows the shares of the three trade types (OWT, VIIT, and HIIT) and the two Grubel-Lloyd indices (GL1 and GL2) on intra-regional automobile parts trade for the ASEAN-4 and other regions. East Asia includes Japan, China, the NIE-3 (Hong Kong, Korea, Singapore), and the ASEAN-4 countries.

The Grubel-Lloyd indices show a stable trend in most regions. Comparing the levels of the Grubel-Lloyd indices, this is generally lower in the ASEAN-4 than in the EU, NAFTA, and MERCOSUR, with the exception of the value of GL1 in 1998. However, there is a slight

[9] 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.

[10] 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.

[11] Complete import data from the PC-TAS are used for the Grubel-Lloyd indices because their calculation does not require trade volume data.

[12] 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 they fall below this cut-off level. In this sense, the cut-off threshold is applied in an irregular manner.

increase in GL2 for the ASEAN-4, which brings it nearly to the EU level of 2001. Turning to the share of horizontal IIT in the ASEAN-4, this is very low and almost stable. On the other hand, the share of vertical IIT in the ASEAN-4 increased dramatically (by 49.7 percentage points) during 1996–2001: while the ASEAN-4 had the lowest share of vertical ITT in 1996 (13.8%), by 2001 it had the highest (63.5%) among all the major trading blocs. Since horizontal IIT was more or less stable during this period, the share of OWT registered a decline of similar proportions.

Nevertheless, the total share of IIT (the sum of VIIT and HIIT) in the ASEAN-4 is still lower than in the other regions. We should also note that the ASEAN-4 show higher Grubel-Lloyd indices than the East Asia region including the ASEAN-4. As for the three trade types, the share of each trade type in East Asia is steady during 1996–2001. In other words, the rapid increase in the share of vertical IIT is a peculiar characteristic of the development of trade patterns in the ASEAN-4 countries during the period 1996–2001.

INSERT FIGURE 2

Next, we turn to recent trends in IIT in the trade among the ASEAN-4 countries (Figure 3). Although GL1 fluctuated after 1996, with the exception of the Indonesian case, it had more or less returned to the original level by 2001. GL2 rose steadily during 1996–2001 for all ASEAN-4 countries. Looking at the share of vertical IIT, this grew remarkably for all ASEAN-4 countries and surpassed the share of OWT in 1998 (Thailand and the Philippines) or 1999 (Malaysia and Indonesia). With the exception of 1997 or 1998, the share of horizontal IIT remained quite low for all ASEAN-4 countries. As for the total share of IIT, this rose to around 70% in 2001 for all ASEAN-4 countries except the Philippines.

INSERT FIGURE 3

Finally, we investigate what sorts of automobile parts are traded within the ASEAN-4. Table 3 shows the shares of each trade type for each ASEAN-4 country by major category of automobile parts in 2001. The commodity classification we used is explained in Appendix 1. Among the total trade in automobile parts within the ASEAN-4, the shares of “engines and engine parts” and “transmissions and machinery parts” are relatively large (ranging from 20.5% to 35.9%). It is important to note that in each ASEAN-4 country, the share of IIT in “engines and engine parts” is quite large. On the other hand, OWT dominates intra-ASEAN-4 trade in “transmissions and machinery parts,” especially for Thailand as an importer and for the Philippines as an exporter. Malaysia also has a large share of total exports in “transmissions and

machinery parts." In addition, Malaysia and Indonesia show relatively large export shares in "electric parts." Unfortunately, we cannot classify "other auto parts" in greater detail under the HS-6digit system. This category counted almost half of trade value in each country and all of them are classified as intra-industry trade.

INSERT TABLE 3

3. An econometric analysis of the determinants of automotive intra-industry trade

3.1 The model and variables

Our descriptive analyses so far has shown that the volume trade in automobile parts has been increasing in the ASEAN countries. We also found that intra-industry trade overall (as measured by the Grubel-Lloyd index) did not change much during the period, though vertical intra-industry trade (IIT where goods are differentiated by quality) seems to have been growing in the ASEAN countries compared with other regions.

In this section, we investigate the determinants of IIT by using regression analysis. Our main focus is on whether the described changes in trade policy and the ensuing improvements in the business environment for the automotive industry in the ASEAN countries have significantly increased IIT and led to a higher degree of IIT than in other regions or countries. Moreover, we test whether the determinants of vertical IIT are different from those of horizontal IIT and whether the determinants of IIT differ with respect to trade in automobiles and automobile parts.

Our analysis of intra-industry trade builds on two different types of measures: the share of VIIT and HIIT, and the traditional Grubel-Lloyd IIT index." The VIIT and the HIIT measures, by definition, only capture the bilateral trade in products that are vertically or horizontally differentiated. They do not capture the bilateral trade in different products which are classified in the same industry, say, automobiles or automobile parts. However, under the AICO framework, Asian countries mainly trade in different kinds of products. For example, Thailand exports engine parts to Indonesia and imports press parts from Indonesia, while the Philippines import engine parts and rubber parts etc. from Thailand and export wire harnesses and transmissions to Thailand (FOURIN 2002). Therefore, in order to capture this type of IIT, we primarily use the Grubel-Lloyd index (*GL1*) as the dependent variable for the regression analysis. VIIT and HIIT shares (*SHVIIT* and *SHHIIT*) are used as dependent variables in order to test whether the determinants of IIT are different for these two types of IIT.

Following the example of preceding studies in this field, we estimate:

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

where IIT_{ijt} stands for *GL1*, *SHVIIT*, or *SHHIIT,* while $DIST_i$: represents the geographic distance and $YEAR_t$ are year dummies; ε_{ijt} is the error term, and subscripts *i* and *j* denote countries *i* and *j*, respectively, while subscript *t* denotes year *t*. As for other explanatory variables, Z_{mijt}, we include variables representing market size, the bilateral difference in per capita incomes, exchange rate fluctuations, the size of a country's automobile industry, sets of FTA dummies, etc.[13, 14]

(1) Market size (*GDP*). As most preceding studies, we include the average GDP in logarithm (the simple average of the GDP value in international dollars of the two economies) as an indicator of the size of two economies trading with each other. We assume that the division of labor between trading partners intensifies with increasing market size. Moreover, larger countries tend to produce and consume a greater variety of goods. We, therefore, expect that the bilateral volume of intra-industry trade is positively related to market size.

(2) Difference in market size (*DGDP*). This variable represents the difference in the market of the two trading partners. Such a difference is traditionally considered as an obstacle to two-way trade in similar products. Therefore, it is expected that the bigger the difference, the lower is the share of intra-industry trade. Following Balassa (1986), Balassa and Bauwens (1987), and other studies, we calculate the difference as:

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

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

This measure is of a better quality than the absolute difference in GDP, because the latter tends to be sensitive to the absolute GDP size of the trade partners. This measure of $DGDP_{ij}$ takes a value between 0 and 1, which is independent of the absolute size of the trade partners' GDP.

(3) The difference in per capita GDP (*DGDPPC*). This variable is defined as the difference

[13] For details on the variables and data sources, see Appendix 3.

[14] Ideally, we would include some FDI variables in our econometric model, because the regional production networks of multinational automobile manufacturers or auto parts suppliers are likely to have a large impact on the growth of IIT. However, it is extremely difficult to obtain bilateral FDI data for the automobile industry. We therefore instead tried to construct an FDI variable based on total FDI inflows and FDI stocks provided by UNCTAD (2003). We calculated the ratio of FDI inflows (or stocks) to GDP for each country and then took the average of the ratios for the two trading countries. Although we estimated the model including this FDI variable, the coefficient was not statistically significant and we decided to drop the variable.

in per capita GDP between the trading partners and measured in a similar way as the variable *DGDP*. It is expected that the more similar the income levels of the trading countries are, the greater is the extent of trade in differentiated products (Linder Hypothesis). That is, similarities in income levels are considered to be associated with similarities in demand structures, resulting in greater mutual trade in differentiated products. Moreover, similarities in income levels are also associated with similarities in the capital-labor ratios of the trading partners. We assume that horizontal and vertical differentiation is defined as the difference in quality (or similarity in quality in the case of horizontal differentiation), and that the higher quality variety of the differentiated good is produced using relatively more capital-intensive techniques. Therefore, we expect that the difference in per capita GDP is negatively related to the volume of IIT and the share of HIIT, and is positively related to the share of VIIT. In addition, we also include *DGDPPC* squared (*SqDGDPPC*) in order to take non-linearity into account.[15]

(4) The geographic distance (*DIST*) and border (*ADJ*). We expect the distance between producers to have a negative impact on two-way trade in goods subject to transportation costs. The variable *DIST* is the distance between the capital cities of the trading partners in logarithm. Moreover, the border or adjacent dummy (*ADJ*) is included because a common border is likely to greatly decrease transport costs and intensify trade between the two countries. It is expected that *DIST* has a negative impact on IIT and that *ADJ* has a positive impact.

(5) Exchange rate fluctuations (*EXR*). Although in theory there is no relationship between exchange rates and the nature of trade, exchange rate fluctuations often affect the volume of trade by changing the relative prices of traded goods. Moreover, exchange rate fluctuations are likely to affect the unit value of traded products which our HIIT/VIIT distinction is based on. The variable *EXR* is defined as the absolute difference between the change in local currency per US dollar in country *i* and the change in local currency per US dollar in country *j*. Because many East Asian countries experienced large exchange rate depreciations during the period studied, we include this variable in order to control for exchange rate fluctuations.

(6) The size of the automobile industry (*AUTO*). It may be presumed that the size of the industry in the trading countries and the volume of IIT are correlated. Therefore, we expect a positive coefficient for this variable.

[15] Fukao et al. (2003), analyzing the determinants of VIIT in the case of Japanese electrical machinery trade, found that *DGDPPC* was negatively related to VIIT and that the square of *DGDPPC* was positively related to VIIT. This means that, in the case of bilateral trade with countries whose per capita GDP differs from Japan's by more than approximately 10,000 international dollars, the greater the difference in per capita GDP, the greater is the share of VIIT.

(7) Regional integration (*AFTA*, *NAFTA*, *EU*, *MERCOSUR*). As regional integration proceeds around the world, decreasing tariff and non-tariff barriers among the member countries of these groupings may have facilitated the intensification of IIT. Although it would be preferable to construct a precise tariff measure, it would be an extremely time consuming task to calculate the average tariff rates (or effective tariff rates) for automobiles and related parts and components for the more than sixty countries included in our regression analysis.[16] Therefore, the tariff variable is proxied by dummy variables indicating the presence of preferential trading agreements. We include four dummy variables which take the value 1 when both trading countries participate in one of the four preferential trading agreements.

We estimate the model by Tobit regression since our dependent variables, *GL1*, *SHVIIT*, and *SHHIIT*, take a value in the range between zero and one, and, moreover, take the value zero or one for many observations.[17]

3.2 Estimation results

Table 4 presents the Tobit regression results for the determinants of IIT measured by GL1.[18] The estimated coefficients on the variables representing market size (*GDP*), the difference in market size (*DGDP*), geographic distance (*DIST*), a common border (*ADJ*), and the size of automotive industry (*AUTO*) are strongly significant and have the expected signs. As for the difference in per capita GDP (*DGDPPC*), a significantly negative coefficient is estimated in the case of the equations for automobiles (equations (1) and (2) in Table 4), which suggests that similarities in income levels result in IIT and supports the "Linder Hypothesis." Although a

[16] A list of the 64 countries included in our regression analysis is shown in Appendix Table 3.

[17] While the logit transformation of the dependent variables has the advantage of ensuring that predicted values are within the appropriate range, it has the disadvantage of excluding all observations where the index of intra-industry trade takes values of zero or one. While not so many observations take 1 for the dependent variables, nearly one-fourth of the observations equal zero in VIIT and more than half of the observations equal zero in HIIT, indicating the absence of vertical and/or horizontal intra-industry trade. Given the need to include zero observations in an econometric investigation, we also estimated the model by a non-linear least squares procedure. The procedure estimates the following logistic function and gives predicted values from zero to one for the index of IIT:

$$IIT(z)_{ijt} = \frac{1}{1+\exp\left(-\beta' x_{ijt}\right)} + \varepsilon_{ijt}$$

where β' is the regression coefficient vector, x is the explanatory variable vector, and ε is the random disturbance term. However, the results of the non-linear estimation were almost same as those of the Tobit regressions. Therefore, we report only the Tobit regression results in this paper.

[18] Although we estimated the econometric model using the variable *GL2* as the dependent variable, the results are mostly consistent with the ones we obtained when using *GL1* as the dependent variable. The estimation results of the *GL2* equations are shown in Appendix Table 4.

positive coefficient is estimated for the variable *SqDGDPPC*, its absolute value is smaller than the one for *DGDPPC* and it is not statistically significant in equations (1) and (2) in Table 4. On the other hand, in the equations for automobile parts (equations (3) and (4) in Table 4), the coefficient on the variable *DGDPPC* is positive but not significant. The estimated coefficient on the variable *SqDGDPPC* is negative and statistically significant. This result suggests that IIT in automobile parts tends to be greater the greater difference in per capita GDP when the per capita GDP difference index is smaller than approximately 0.19. As for regional integration, the estimated coefficients suggest that IIT in automobiles between MERCOSUR countries is larger than the average IIT level. Although IIT in automobiles between EU countries is significantly larger in 1996, it has decreased since then (equations (1) and (2) in Table 4). As for IIT in automobile parts, the estimated equations (3) and (4) in Table 4 show that IIT between AFTA countries and between MERCOSUR countries was significantly larger than the average. However, the insignificant coefficient on the cross-term *AFTA_TR* suggests that IIT between AFTA countries shows neither an increasing trend nor a decreasing trend. Although IIT in automobile parts between EU countries is significantly larger in 1996, it has decreased since then. In addition, the estimated coefficients on the year dummies suggest that IIT in automobile parts increased significantly in the years 1998, 1999, and 2000 worldwide.

INSERT TABLE 4

The estimation results for the determinants of VIIT and HIIT in automobiles are shown in Table 5, while the results for automobile parts are shown in Table 6. As in the estimation using GL1 shown in Table 4, the estimated coefficients on the variables representing market size (*GDP*), the difference in market size (*DGDP*), geographic distance (*DIST*), a common border (*ADJ*), and the size of automotive industry (*AUTO*) are highly significant in most cases and have the expected signs. As for the difference in per capita GDP, the estimated coefficients suggest that the larger the difference in per capita GDP, the smaller is HIIT in the case of IIT in both automobiles and automobile parts (equations (3) and (4) in Tables 5 and 6). Comparing equations (1) and (2) in Table 5 with equations (1) and (2) in Table 6 shows that in the case of VIIT, however, the effect of the per capita GDP difference on trade in automobiles (Table 5) is not the same as the effect estimated in the regressions on IIT in automobile parts shown in Table 6. As for VIIT in automobiles, the estimated coefficients on *DGDPPC* are negative and significant while the estimated coefficients on *SqDGDPPC* are positive and significant. These results suggest that the larger the difference in per capita GDP, the smaller is VIIT as long as the per capita GDP difference index is smaller than approximately 0.9. In contrast, in the case of VIIT in automobile parts the effect is reversed. That is, larger VIIT is associated with a larger

difference in per capita GDP when the per capita GDP difference index is smaller than approximately 0.34. Therefore, the "Linder Hypothesis" is supported in the case of automobiles, but in the case of automobile parts, the share of HIIT is negatively related to the difference in per capita GDP while the share of VIIT is positively related to it, as we expected. Therefore, the "Linder Hypothesis" is supported in the case of automobiles, but *not* in the case of automobile parts, where the share of HIIT is negatively related to the difference in per capita GDP while the share of VIIT is positively related to it, as we expected. Turning to regional integration, the share of HIIT in automobiles and automobile parts between EU countries tended to be larger in 1996 but has decreased since then (equations (3) in Tables 5 and 6). The estimated coefficients show that MERCOSUR tends to have higher shares of both HIIT and VIIT compared with the average in the case of both automobiles and automobile parts. A positive coefficient on the AFTA dummy is obtained for both VIIT and HIIT in automobile parts, but is not statistically significant in most cases (Table 6). In addition, the estimated coefficients on the year dummies suggest that the share of VIIT in automobile parts increased significantly worldwide in the years 1998, 1999, and 2000.

Finally, let us examine the change in Grubel-Lloyd IIT Index (*GL1*) and its sources in each region, using the estimated equation (3) in Table 4. Table 7 shows the result of the decomposition analysis of the sources of IIT growth.[19] During the period from 1996 to 2001, the change in the *GL1* is positive, and it is largest for NAFTA, while the EU and MERCOSUR saw a large decline in the *GL1*. The G-L index for AFTA increased slightly. As for the AFTA region, the increase of the IIT index is attributable mainly to the size of the automobile industry (*AUTO*), average market size (*GDP*), and smaller differences in GDP (*DGDP*). The contribution of each of the sources is 118.7 percent, 67.0 percent, and 43.1 percent, respectively, all of which are much larger than in the other regions. In particular, the large positive contribution of the size of the automobile industry (*AUTO*) is conspicuous in the AFTA region. However, only in the NAFTA region can a large positive impact of the introduction of an FTA on IIT be observed. In the other regions, including the AFTA region, FTAs seem to have had a negative impact on IIT.

INSERT TABLES 5 & 6

4. Conclusions

The preceding analysis of intra-ASEAN trade in the automotive industry has shown that the share of vertical intra-industry trade in the region has risen substantially in the late 1990s even

[19] The contribution of each factor to IIT growth is calculated using the estimated coefficients of equation (3) in Table 4 and the average value of each explanatory variable for each region and for each year.

though the traditional intra-industry trade index was relatively stable.

Our analysis revealed that exports of auto parts from ASEAN countries have increased in recent years and that intra-ASEAN auto parts trade seems to have increased relatively more than ASEAN auto parts trade with other regions. Looking at intra-ASEAN auto parts trade in detail, however, we found that although the Grubel-Lloyd index – the index most frequently used – showed a steady trend in the ASEAN and other regions, the level of the index is considerably lower in ASEAN than in NAFTA and MERCOSUR, though only slightly lower than in the EU.

In order to establish whether intra-regional trade in ASEAN is of an "inter-industry," "vertical intra-industry," or "horizontal intra-industry" nature, we calculated the share of each trade type. We found that VIIT showed a rapid increase while HIIT remained at a very low level in ASEAN, which is one of the conspicuous characteristics for the region. A closer look at various IIT indices for trade among the ASEAN-4 countries confirmed that the Grubel-Lloyd IIT index showed an increasing trend only in the case of trade between Indonesia and other ASEAN countries and that VIIT has increased for all the ASEAN-4 countries.

Moreover, we found that Thailand was the largest exporter and importer of automobile parts in ASEAN and that engines and engine parts were the major components traded among the ASEAN-4 countries. Most intra-industry trade in the region, however, was concentrated in miscellaneous automobile parts. As of 2001, Malaysia's main exports in the automotive sector consisted of electric parts and transmissions and machinery parts, a large part of which were classified as IIT. On the other hand, the main exports of the Philippines were transmissions and machinery parts, while Indonesia primarily exported electric parts, most of which were classified as one-way trade, not IIT.

Taking the descriptive analysis as a cue, we then conducted an econometric investigation to test for the determinants of IIT. The main aims of the econometric analysis were to see whether any factors peculiar to the AFTA countries contributed to the increase in IIT in the region, to test whether the determinants of VIIT were different from those of HIIT, and to examine whether the determinants of IIT differed with respect to trade in automobiles and auto parts. For the AFTA countries, the estimated coefficients suggest that increasing market size, the decreasing difference in market size, and the increasing size of the automotive industry were major sources of IIT (*GLI*) growth. However, the coefficients on the AFTA dummy and on the cross-term *AFTA_TR*, which we used as a proxy for regional integration, were not significant in many of the equations. We may interpret this result as suggesting that the regional FTA has not contributed to IIT growth in the AFTA countries. However, this may not be surprising, since the largest FTA-related reductions of tariffs on auto-related products were only implemented after 2002, while our analysis only covered the period from 1996 to 2001. Our findings imply that automotive IIT growth in the ASEAN region until 2001 was mainly led by the growth of market

and industry size, not by region-specific factors. We expect, however, that the deepening of the regional FTA will contribute more to regional IIT in the near future, as tariffs on auto-related products were lowered to 5 percent by January 2004 in the AFTA countries except Malaysia.

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

INSERT APPENDIX TABLE 1

Appendix 2. Methodology for the 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 values
"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 $1.25 < \frac{UV_{kk'j}}{UV_{k'kj}}$

Appendix 3. Definition of Variables Used in the Econometric Analysis and Data Sources

GDP

The GDP data and per capita GDP data are taken from World Bank (2003).

DIST

The distance data are taken from Haveman (2003). In the case of countries where distance data are not available in Haveman (2003), the distance is calculated using the following website: http://www.indo.com/distance/index.html.

ADJ

The information on which countries have a common land border is taken from Haveman (2003).

EXR

The exchange rate data are taken from World Bank (2003).

AUTO

The variable *AUTO* is constructed as follows. First, the ratio of automotive industry output (in current US dollars) to GDP (in current US dollars) is calculated for each country. Then the variable *AUTO* is calculated by taking a simple average of the ratios of the two trading economies. The data on automotive output are taken from UNIDO (2003), *Industry Statistics Database: 3-Digit Level of ISIC Code (Revision 2)*. Automotive output here refers to the output value of the transportation equipment industry [ISIC (International Standard Industry Classification) -Revision 2: 384]. The 4-digit ISIC (Revision 2) includes the motor-vehicle-related industry "manufacture of motor vehicles" (ISIC-Revision 2: 3843), while the 4-digit ISIC (Revision 3) includes the three detailed categories "motor vehicles" (ISIC-Revision 3: 3410), "automobile bodies, trailers, and semi-trailers" (ISIC-Revision 3: 3420), and "parts or accessories for automobiles" (ISIC-Revision 3: 3430). However, these disaggregated data at the 4-digit level are not available for many countries. Therefore, we use the data based on the 3-digit level data of ISIC-Revision 2. Still, even though data are available for most countries at the 3-digit level, there are several countries for which this is not the case, and there are several years for which the data are missing. The missing data are interpolated using a time trend and the number of units of automobile produced.

INSERT APPENDIX TABLES 3 & 4

Appendix 4. Matrices of the Share of Each Trade Type for Major East Asian Countries and Regions

INSERT APPENDIX TABLE 5

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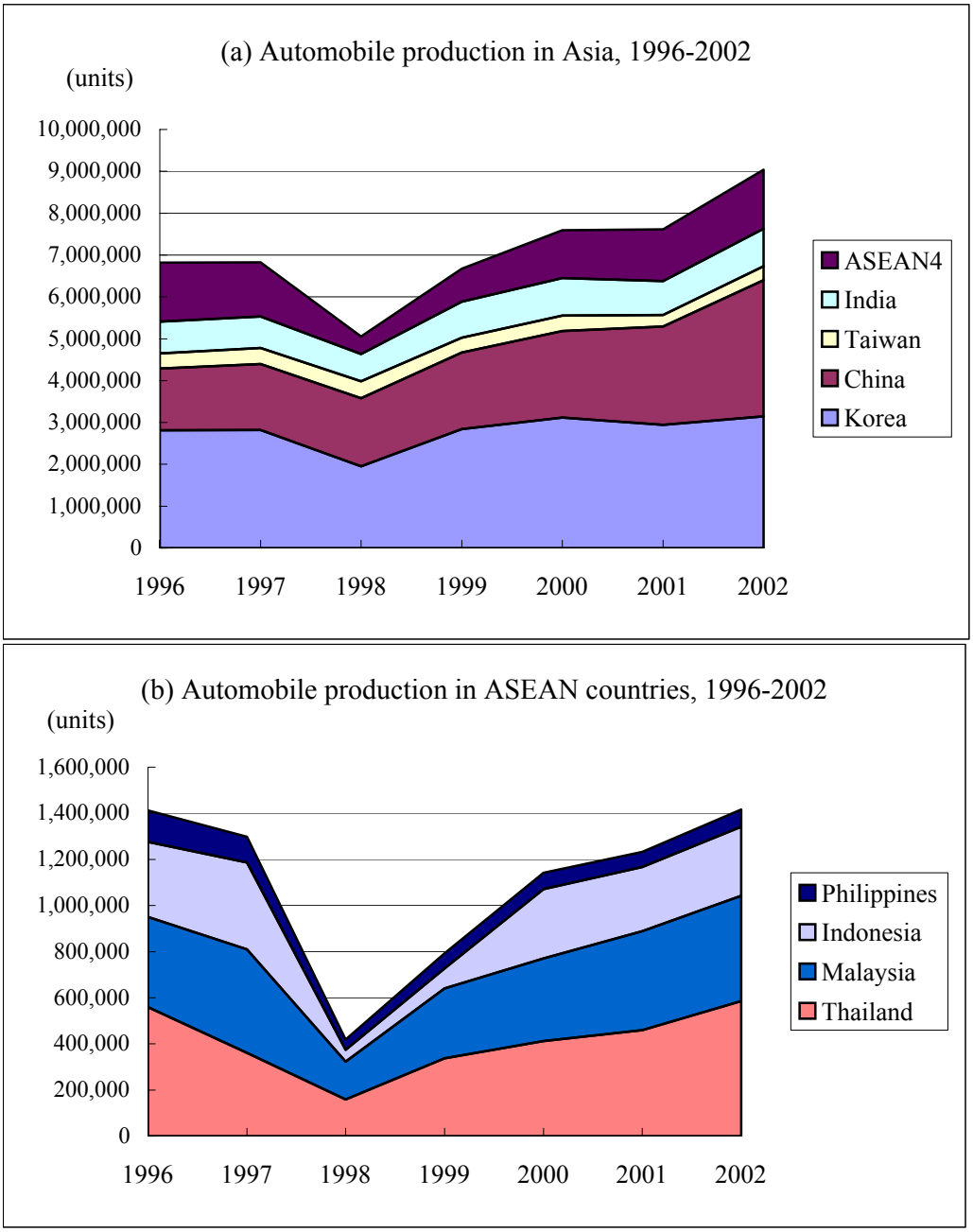


Figure 1. Automobile production in major Asian countries, 1996-2002

Notes: 1) Unit figures refer to the sum of passenger cars and commercial vehicles.

2) Figures for the Philippines in 1999-2002 represent sales units of domestically produced automobiles.

Source: FOURIN (2003), 2003/2004 Ajia Jidosha Buhin Sangyo [Asian Automotive Components Industry, 2003/2004], p. 19, Nagoya: FOURIN.

Table 1. Trends in automotive exports for major East Asian countries, 1996-2001

(a) Automotive exports in current US dollars (US$ Mil.)

	1996		1997	1998	1999	2000	2001	
Automobiles		(%)						(%)
Japan	**50,507**		**58,625**	**59,628**	**62,226**	**64,191**	**59,327**	
Korea	**10,427**		**10,652**	**9,894**	**11,105**	**13,153**	**13,260**	
China	**147**		**190**	**157**	**102**	**194**	**208**	
ASEAN-4	**448**	**(100)**	**829**	**1,021**	**1,518**	**1,771**	**2,015**	**(100)**
Thailand	201	(45)	567	716	1,274	1,626	1,923	(95)
Malaysia	201	(45)	216	246	170	111	61	(3)
Philippines	8	(2)	7	15	4	6	3	(0)
Indonesia	37	(8)	40	44	69	28	28	(1)
Automobile parts								
Japan	**38,518**		**34,896**	**30,576**	**34,898**	**39,672**	**34,220**	
Korea	**3,628**		**3,928**	**3,816**	**4,192**	**4,468**	**4,577**	
China	**2,380**		**2,808**	**3,136**	**4,012**	**5,386**	**5,830**	
ASEAN-4	**3,189**	**(100)**	**3,466**	**3,710**	**4,589**	**5,567**	**5,181**	**(100)**
Thailand	813	(25)	932	1,119	1,252	1,723	1,628	(31)
Malaysia	865	(27)	920	1,028	1,390	1,284	947	(18)
Philippines	855	(27)	959	902	1,150	1,386	1,333	(26)
Indonesia	656	(21)	654	662	797	1,174	1,273	(25)

(b) Index of automotive exports for ASEAN-4 countries (1996=100)

	1996	1997	1998	1999	2000	2001
Automobiles						
Thailand	100	346	546	854	1,101	1,401
Malaysia	100	119	184	116	76	42
Philippines	100	98	231	56	89	53
Indonesia	100	354	818	891	373	418
Automobile parts						
Thailand	100	141	211	208	288	293
Malaysia	100	118	178	220	205	151
Philippines	100	126	141	166	219	236
Indonesia	100	327	681	571	860	1,052

Note: The index of automotive exports is calculated as follows: 1) export values in current US dollars are converted to local currency values using the annual average exchange rate; 2) local currency values are deflated using the producer price index for transport equipments (in the case of the Philippines, the wholesale price index for machinery and transport equipments in metropolitan Manila are used, while in the case of Indonesia, the producer price index for machinery and transport equipments is used); and 3) the values are standardized using 1996 as the base year.

Source: PC-TAS 1996-2000, 1997-2001

Exchange rate: ICSEAD (2003)

Producer price index: Bank of Thailand (2004); Bank Negara Malaysia (2004); Bangko Sentral ng Pilipinas (2003); BPS-Statistics Indonesia (2003).

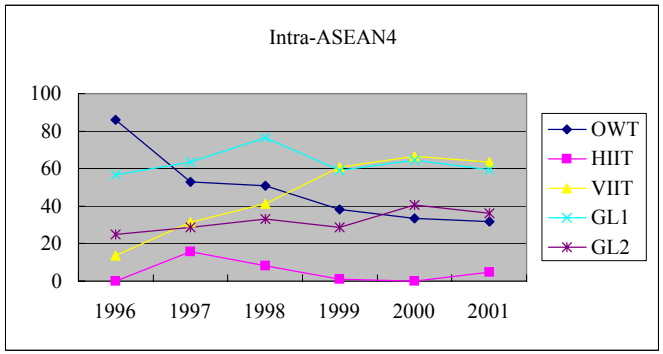
Table 2. Destinations of ASEAN-4 automotive exports

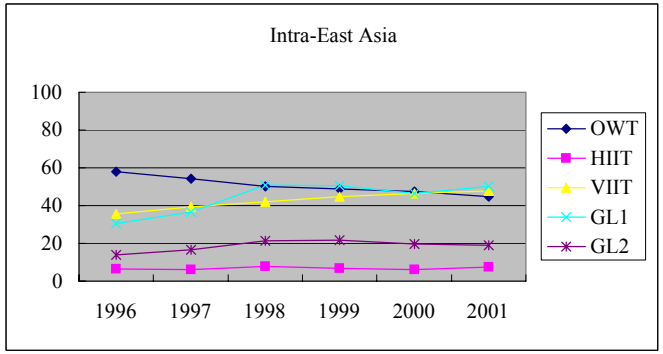
(%)

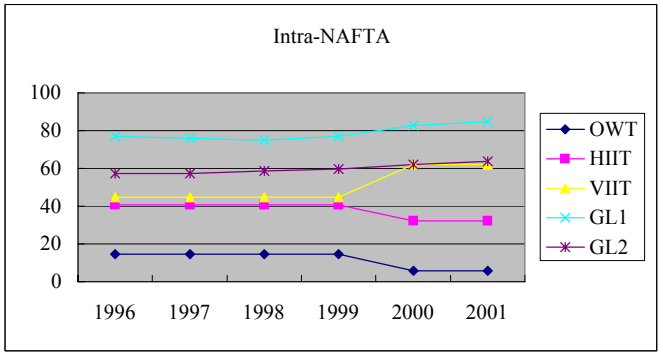
	1996	1997	1998	1999	2000	2001
Automobiles						
ASEAN4	11	4	1	2	3	4
AUS-NZ	6	13	13	26	29	18
East Asia	13	8	9	7	8	5
EU	60	57	47	40	36	47
JAPAN	2	4	1	0	0	5
NAFTA	0	0	2	0	0	0
Other	8	14	26	24	23	21
	100	100	100	100	100	100
Auto Parts						
ASEAN4	9	10	4	8	12	14
AUS-NZ	3	2	3	3	3	3
EU	21	19	24	20	18	18
East Asia	16	18	16	15	15	15
JAPAN	18	20	19	20	20	20
NAFTA	24	22	23	24	21	19
Other	8	8	10	9	10	10
	100	100	100	100	100	100

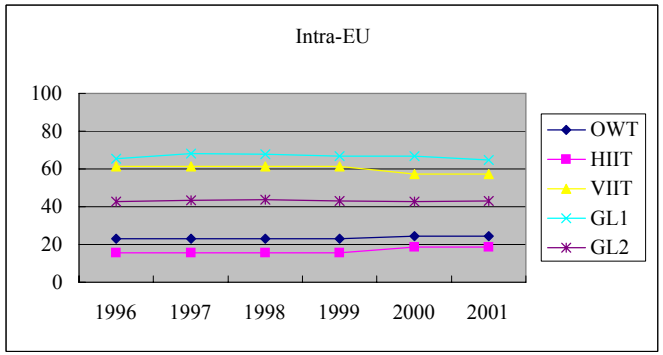
Source: PC-TAS 1996-2000, 1997-2001

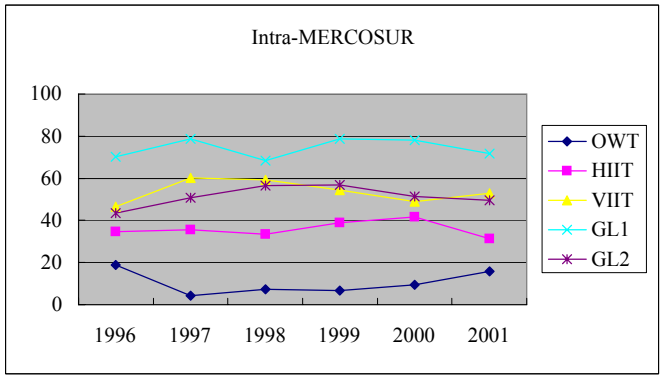
Figure 2: Evolution of the shares of trade types and the GL indicators in intra-regional automobile parts trade, 1996-2001





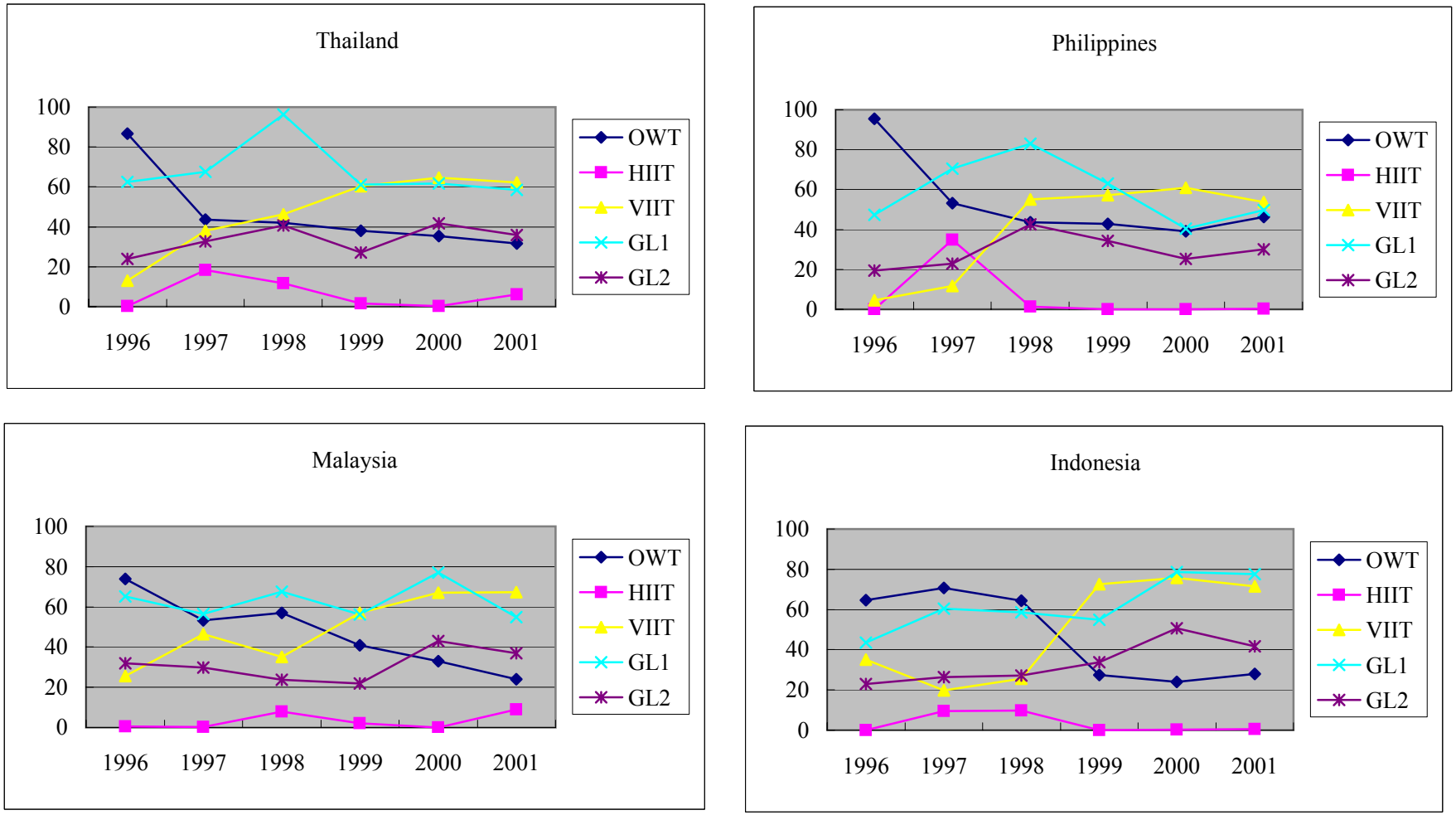






Source: Authors' calculation based on PC-TAS.

Figure 3: Evolution of the shares of trade types and the GL indicators in intra-ASEAN4 automobile parts trade, 1996-200



Source: Authors' calculation based on PC-TAS.

Table 3: Intra-ASEAN trade in automobile parts by trade types in 2001

(% and 1,000 US$)

Auto Parts		THAILAND			MALAYSIA			PHILIPPINES			INDONESIA		
		total exp	total imp	total trade	total exp	total imp	total trade	total exp	total imp	total trade	total exp	total imp	total trade
Brakes and Parts under Foot	IIT (%)	0.38	0.72	0.55	0.78	0.30	0.43	0.12	0.34	0.18	0.99	0.47	0.78
	OWT (%)	2.78	0.18	1.47	0.53	4.16	3.18	1.88	0.31	1.45	0.01	0.10	0.04
	Total (%)	3.16	0.90	2.02	1.31	4.47	3.61	2.00	0.66	1.64	1.00	0.57	0.83
Electric Parts	IIT (%)	2.71	2.95	2.83	8.48	2.59	4.18	0.50	1.39	0.74	1.01	2.13	1.46
	OWT (%)	3.81	9.68	6.78	1.16	3.73	3.03	4.39	1.30	3.55	17.93	8.69	14.24
	Total (%)	6.51	12.63	9.61	9.63	6.32	7.22	4.89	2.69	4.29	18.94	10.83	15.70
Engines and Engine Parts	IIT (%)	7.97	4.12	6.03	15.19	6.79	9.07	2.07	3.49	2.46	6.62	18.52	11.37
	OWT (%)	9.50	0.47	4.93	0.34	2.11	1.63	1.68	19.67	6.58	1.74	10.04	5.06
	Total (%)	17.47	4.60	10.96	15.52	8.90	10.69	3.75	23.17	9.04	8.36	28.56	16.43
Tires and Glass	IIT (%)	4.51	0.85	2.66	1.85	4.53	3.81	0.00	0.00	0.00	0.37	0.28	0.34
	OWT (%)	6.66	0.07	3.33	0.41	4.43	3.34	0.05	18.00	4.94	5.48	0.21	3.37
	Total (%)	11.16	0.93	5.99	2.26	8.96	7.14	0.05	18.00	4.94	5.85	0.49	3.71
Transmissions and Machinery Parts	IIT (%)	1.54	2.94	2.24	10.72	1.89	4.29	0.27	2.44	0.86	2.20	3.72	2.80
	OWT (%)	2.76	23.10	13.05	8.41	5.70	6.43	34.66	2.91	26.01	0.05	3.13	1.28
	Total (%)	4.30	26.04	15.30	19.13	7.59	10.72	34.92	5.35	26.87	2.24	6.85	4.08
Vehicle Bodies and Body Parts	IIT (%)	6.46	1.67	4.04	4.89	6.65	6.17	0.30	2.04	0.78	5.35	7.32	6.14
	OWT (%)	4.12	0.22	2.15	9.04	5.24	6.27	2.87	5.65	3.63	0.93	8.54	3.97
	Total (%)	10.58	1.88	6.18	13.93	11.88	12.44	3.17	7.69	4.40	6.28	15.86	10.10
Other Auto Parts	IIT (%)	46.81	53.02	49.95	38.22	51.88	48.18	51.22	42.44	48.83	57.33	36.84	49.15
	OWT (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total (%)	46.81	53.02	49.95	38.22	51.88	48.18	51.22	42.44	48.83	57.33	36.84	49.15
Auto Parts Total	IIT (%)	70.37	66.27	68.30	80.12	74.63	76.12	54.48	52.14	53.84	73.87	69.29	72.04
	OWT (%)	29.63	33.73	31.70	19.88	25.37	23.88	45.52	47.86	46.16	26.13	30.71	27.96
	Total (1,000 US$)	191,140	195,598	386,738	69,012	185,523	254,535	139,500	52,216	191,716	105,973	70,399	176,372

Table 4. Regression results: Grubel-Lloyd IIT index

	Dependent Variables			
	automobiles	*automobiles*	*auto parts*	*auto parts*
	GL1	GL1	GL1	GL1
	(1)	(2)	(3)	(4)
GDP	0.0933 ***	0.0932 ***	0.0784 ***	0.0781 ***
	(10.20)	(10.18)	(11.11)	(11.06)
DGDP	-0.3010 ***	-0.3003 ***	-0.2197 ***	-0.2188 ***
	(-11.01)	(-10.98)	(-9.81)	(-9.76)
DGDPPC	-0.4278 ***	-0.4250 ***	0.0836	0.0847
	(-3.39)	(-3.37)	(0.88)	(0.90)
SqDGDPPC	0.2417	0.2364	-0.4424 ***	-0.4434 ***
	(1.03)	(1.01)	(-2.63)	(-2.64)
DIST	-0.1078 ***	-0.1077 ***	-0.0859 ***	-0.0858 ***
	(-12.45)	(-12.43)	(-12.56)	(-12.54)
ADJ	0.1252 ***	0.1253 ***	0.0495 *	0.0494 *
	(4.37)	(4.37)	(1.91)	(1.91)
EXR	0.0373 ***	0.0366 ***	0.0365 ***	0.0359 ***
	(2.69)	(2.64)	(3.67)	(3.60)
AUTO	1.0472 ***	1.0580 ***	1.2977 ***	1.3173 ***
	(3.55)	(3.59)	(5.54)	(5.63)
AFTA	-0.0131	-0.0811	0.1570 *	0.1302 ***
	(-0.14)	(-1.53)	(1.94)	(2.82)
NAFTA	-0.1506	-0.1348	0.0705	0.1070
	(-0.90)	(-1.38)	(0.41)	(1.08)
EU	0.0674 **	0.0239	0.0860 ***	0.0129
	(2.01)	(1.07)	(2.72)	(0.63)
MERCOSUR	0.4105 ***	0.3402 ***	0.2379 *	0.1434 *
	(3.00)	(4.24)	(1.69)	(1.76)
AFTA_TR	-0.0267		-0.0107	
	(-0.87)		(-0.40)	
NAFTA_TR	0.0064		0.0147	
	(0.12)		(0.26)	
EU_TR	-0.0175 *		-0.0293 ***	
	(-1.73)		(-3.02)	
MERCOSUR_TR	-0.0282		-0.0378	
	(-0.63)		(-0.83)	
D1997	-0.0044	-0.0083	0.0151	0.0112
	(-0.19)	(-0.36)	(0.82)	(0.61)
D1998	-0.0160	-0.0236	0.0443 **	0.0366 **
	(-0.69)	(-1.03)	(2.38)	(1.99)
D1999	0.0042	-0.0071	0.0563 ***	0.0449 **
	(0.18)	(-0.31)	(2.98)	(2.43)
D2000	0.0274	0.0125	0.0557 ***	0.0407 **
	(1.14)	(0.55)	(2.92)	(2.21)
D2001	-0.0524 **	-0.0716 ***	-0.0457 **	-0.0647 ***
	(-2.07)	(-3.08)	(-2.32)	(-3.46)
_cons	-1.3827 ***	-1.3722 ***	-0.9899 ***	-0.9754 ***
	(-6.33)	(-6.28)	(-5.74)	(-5.65)
Number of obs.	2566	2566	4032	4032
LR	625.98 ***	622.07 ***	607.82 ***	597.95 ***
Pseudo R-squared	0.2370	0.2355	0.1609	0.1583
Dep. Var. <=0	544	544	437	437
Dep. Var. >=1	1	1	2	2

Notes: The numbers in parentheses are t-statistics.
*significant at 10% level, ** significant at 5% level, ***significant at 1% level (two-tailed test)
Source: Authors' calculations.

Table 5. Regression results: Automobile industry

	Dependent Variables			
	automobile	*automobile*	*automobile*	*automobile*
	SHVIIT25	SHVIIT25	SHHIIT25	SHHIIT25
	(1)	(2)	(3)	(4)
GDP	0.0978 ***	0.0976 ***	0.2402 ***	0.2398 ***
	(4.76)	(4.75)	(9.56)	(9.52)
DGDP	-0.1808 ***	-0.1804 ***	-0.5433 ***	-0.5392 ***
	(-3.13)	(-3.12)	(-7.71)	(-7.63)
DGDPPC	-0.8696 ***	-0.8682 ***	-0.1112	-0.1054
	(-3.12)	(-3.11)	(-0.29)	(-0.27)
SqDGDPPC	0.9603 *	0.9615 *	-1.8131 **	-1.8343 **
	(1.79)	(1.79)	(-2.09)	(-2.11)
DIST	-0.1096 ***	-0.1097 ***	-0.1981 ***	-0.1982 ***
	(-6.19)	(-6.19)	(-9.35)	(-9.33)
ADJ	0.1786 ***	0.1791 ***	0.1942 ***	0.1941 ***
	(3.37)	(3.38)	(3.53)	(3.51)
EXR	0.0760 ***	0.0754 ***	0.0427	0.0414
	(2.92)	(2.90)	(1.46)	(1.42)
AUTO	1.2943 **	1.3393 **	1.8463 **	1.9061 **
	(2.06)	(2.13)	(2.56)	(2.64)
AFTA	-0.0782	0.1343	0.2499	-0.0576
	(-0.43)	(1.33)	(1.27)	(-0.49)
NAFTA	-0.4864	-0.4390 *	0.5073	0.4068 *
	(-1.22)	(-1.89)	(1.33)	(1.82)
EU	0.0058	-0.0501	0.2348 ***	0.1352 **
	(0.09)	(-1.12)	(3.27)	(2.76)
MERCOSUR	0.4101 *	0.2526 *	0.2278	0.3988 ***
	(1.75)	(1.83)	(0.91)	(2.85)
AFTA_TR	0.0852		-0.1330 *	
	(1.43)		(-1.84)	
NAFTA_TR	0.0194		-0.0398	
	(0.15)		(-0.32)	
EU_TR	-0.0225		-0.0406 *	
	(-1.11)		(-1.87)	
MERCOSUR_TR	-0.0640		0.0640	
	(-0.83)		(0.82)	
D1997	0.0197	0.0157	0.0776	0.0626
	(0.41)	(0.33)	(1.38)	(1.12)
D1998	-0.0137	-0.0211	0.1337 **	0.1060 *
	(-0.28)	(-0.44)	(2.35)	(1.92)
D1999	0.0135	0.0024	0.1260 **	0.0860 *
	(0.27)	(0.05)	(2.14)	(1.56)
D2000	0.0615	0.0472	0.0595	0.0081
	(1.21)	(1.00)	(0.96)	(0.14)
D2001	-0.0062	-0.0248	0.0212	-0.0423
	(-0.11)	(-0.51)	(0.32)	(-0.74)
_cons	-1.8251 ***	-1.8129 ***	-5.3190 ***	-5.2814 ***
	(-3.76)	(-3.73)	(-8.98)	(-8.89)
Number of obs	2060	2060	2060	2060
LR	177.45 ***	173.26 ***	508.43 ***	500.93 ***
Pseudo R-squared	0.0562	0.0536	0.2175	0.2142
Dep. Var. <=0	1059	1059	1541	1541
Dep. Var. >=1	90	90	15	15

Notes: The numbers in parentheses are t-statistics.
*significant at 10% level, ** significant at 5% level, ***significant at 1% level (two-tailed test)
Source: Authors' calculations.

Table 6. Regression results: Automobile parts industry

	Dependent Variables			
	auto parts	*auto parts*	*auto parts*	*auto parts*
	SHVIIT25	SHVIIT25	SHHIIT25	SHHIIT25
	(1)	(2)	(3)	(4)
GDP	0.0620 ***	0.0618 ***	0.0741 ***	0.0739 ***
	(7.80)	(7.76)	(10.10)	(10.07)
DGDP	-0.1450 ***	-0.1443 ***	-0.1885 ***	-0.1878 ***
	(-5.75)	(-5.72)	(-8.21)	(-8.18)
DGDPPC	0.2446 **	0.2470 **	-0.4168 ***	-0.4154 ***
	(2.27)	(2.29)	(-4.12)	(-4.11)
SqDGDPPC	-0.7024 ***	-0.7048 ***	0.2810	0.2791
	(-3.61)	(-3.62)	(1.50)	(1.49)
DIST	-0.0889 ***	-0.0889 ***	-0.0926 ***	-0.0926 ***
	(-11.62)	(-11.60)	(-13.38)	(-13.36)
ADJ	0.0281	0.0282	0.0856 ***	0.0856 ***
	(0.99)	(0.99)	(3.68)	(3.67)
EXR	0.0417 ***	0.0412 ***	0.0264 ***	0.0258 ***
	(3.81)	(3.76)	(2.80)	(2.74)
AUTO	1.2014 ***	1.2230 ***	1.1331 ***	1.1513 ***
	(4.59)	(4.67)	(4.86)	(4.93)
AFTA	0.0266	0.1266 **	0.0536	0.0227
	(0.30)	(2.52)	(0.74)	(0.54)
NAFTA	-0.2649	-0.2891 ***	-0.1496	-0.1878 **
	(-1.42)	(-2.68)	(-0.95)	(-2.07)
EU	0.0476	-0.0084	0.0687 **	0.0248
	(1.36)	(-0.37)	(2.35)	(1.30)
MERCOSUR	0.2895 *	0.1392	0.2120 *	0.1845 ***
	(1.90)	(1.57)	(1.75)	(2.61)
AFTA_TR	0.0401		-0.0125	
	(1.39)		(-0.52)	
NAFTA_TR	-0.0096		-0.0154	
	(-0.16)		(-0.29)	
EU_TR	-0.0225 **		-0.0176 **	
	(-2.10)		(-1.98)	
MERCOSUR_TR	-0.0602		-0.0111	
	(-1.21)		(-0.28)	
D1997	0.0449 **	0.0422 **	0.0087	0.0058
	(2.14)	(2.02)	(0.46)	(0.31)
D1998	0.1071 ***	0.1019 ***	0.0284	0.0224
	(5.11)	(4.91)	(1.51)	(1.21)
D1999	0.1124 ***	0.1048 ***	0.0277	0.0187
	(5.28)	(5.02)	(1.45)	(1.01)
D2000	0.1284 ***	0.1183 ***	0.0484 **	0.0367 **
	(5.98)	(5.73)	(2.51)	(2.00)
D2001	0.0819 ***	0.0693 ***	-0.0030	-0.0179
	(3.68)	(3.30)	(-0.15)	(-0.95)
_cons	-0.8292 ***	-0.8177 ***	-1.2970 ***	-1.2862 ***
	(-4.27)	(-4.21)	(-7.34)	(-7.28)
Number of obs	4000	4000	4000	4000
LR	423.63 ***	415.64 ***	717.21 ***	713.03 ***
Pseudo R-squared	0.0889	0.0872	0.2007	0.1995
Dep. Var. <=0	969	969	2213	2213
Dep. Var. >=1	154	154	34	34

Notes: The numbers in parentheses are t-statistics.
*significant at 10% level, ** significant at 5% level, ***significant at 1% level (two-tailed test)
Source: Authors' calculations.

Table 7. Change in Grubel-Lloyd index and its sources in each region

--- Automobile parts industry, 1996 - 2001 ---

	Average GL1 (%)		*Sources of ΔGL1 from 1996 to 2001 (share of contribution is in parentheses)*								
	1996	2001	ΔGL1 Total	GDP	DGDP	DGDPPC	$DGDPPC^2$	EXR	AUTO	FTA_TR[a]	Others
AFTA	61.740	63.306	1.566	1.049	0.675	0.141	-0.314	0.296	1.859	-5.360	3.220
			(100)	(67.0)	(43.1)	(9.0)	(-20.0)	(18.9)	(118.7)	(-342.3)	(205.6)
NAFTA	80.224	86.718	6.494	1.746	0.094	-0.027	0.051	-0.256	-0.722	7.337	-1.730
			(100)	(26.9)	(1.4)	(-0.4)	(0.8)	(-3.9)	(-11.1)	(113.0)	(-26.6)
EU	60.728	46.719	-14.009	1.291	0.593	-0.007	0.003	-0.080	-0.317	-14.668	-0.822
			(-100)	(9.2)	(4.2)	(-0.1)	(0.0)	(-0.6)	(-2.3)	(-104.7)	(-5.9)
MERCOSUR	77.942	60.808	-17.134	1.085	-0.300	-0.053	0.017	0.073	3.885	-18.915	-2.926
			(-100)	(6.3)	(-1.8)	(-0.3)	(0.1)	(0.4)	(22.7)	(-110.4)	(-17.1)

[a] The variable FTA_TR denotes AFTA_TR for the AFTA region, NAFTA_TR for the NAFTA region, EU_TR for the EU region, and MERCOSUR_TR for the MERCOSUR region.

Source: Authors' calculations based on the estimated results in equation (3) in Table 4.

Appendix Table 1. List of automotive related products at the HS 6-digit level

Product Groups	HS Code	Description of the HS 6-digit Products
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 reciprocating piston engine displacing not more than 1000 cc
	870322	Automobiles w reciprocating piston engine displacing > 1000 cc to 1500 cc
	870323	Automobiles w reciprocating piston engine displacing > 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
	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 5 tonnes
	870422	Diesel powered trucks with a GVW exceeding 5 tonnes but not exceeding 20 tons
	870423	Diesel powered trucks with a GVW exceeding 20 tons
	870431	Gas powered trucks with a GVW not exceeding 5 tons
	870432	Gas powered trucks with a GVW exceeding 5 tons
	870490	Trucks nes
	870510	Mobile cranes
	870520	Mobile drilling derricks
	870530	Fire fighting vehicles
	870540	Mobile concrete mixers
	870590	Special purpose motor vehicles nes
Tires and Glass	401110	Pneumatic tire new of rubber for motor car incl. station wagons & racing 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 of cushioned tires, interchangeable tire treads & tire flaps of rubber
	401310	Inner tubes of rubber for motor cars etc buses or lorries
	700711	Safety glass toughened (tempered) for vehicles, aircraft, spacecraft/vessel
	700721	Safety glass laminated for vehicles, aircraft, spacecraft or vessels
	700910	Rear-view mirrors for vehicles
Engines and Engine Parts	840731	Engines, spark-ignition reciprocating, displacing not more than 50 cc
	840732	Engines, spark-ignition reciprocating, displacing >50 cc but not 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
	840991	Parts for spark-ignition type engines nes
	840999	Parts for diesel and semi-diesel engines
	841330	Fuel, lubricating or cooling medium pumps for internal 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

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

Product Groups	HS Code	Description of the HS 6-digit Products
Electric Parts	850710	Lead-acid electric accumulators of a kind used for starting piston engines
	850720	Lead-acid electric accumulators nes
	850730	Nickel-cadmium electric accumulators
	850740	Nickel-iron electric accumulators
	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 wiring sets & other wiring sets used in vehicles, aircraft etc
Chassis fitted with Engines	870600	Chassis fitted with engines for the vehicles of heading Nos 87.01 to 87.05
Vehicle Bodies	830120	Locks of a kind used for motor vehicles of base metal
and Body Parts	830230	Mountings, fittings & similar articles of base metal for motor vehicles, nes
	870710	Bodies for passenger carrying vehicles
	870790	Bodies for tractors, buses, trucks and special purpose vehicles
	870810	Bumpers and parts for motor vehicles
	870821	Safety seat belts for motor vehicles
	870829	Parts and accessories of bodies nes for motor vehicles
	870891	Radiators for motor vehicles
	870892	Mufflers and exhaust pipes for motor vehicles
	870894	Steering wheels, steering columns and steering boxes for motor vehicles
	910400	Instrument panel clocks & clocks of a similar type for vehicles, aircraft, etc.
	940120	Seats, motor vehicles
	940190	Parts of seats other than those of heading No 94.02
Brakes and Parts under foot	870831	Mounted brake linings for motor vehicles
	870839	Brake system parts nes for motor vehicles
	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
Transmissions	848310	Transmission shafts and cranks, including cam shafts and crank shafts
and Machinery Parts	848320	Bearing housings, incorporating ball or roller bearings
	848330	Bearing housings, not incorporating ball/roller bearings; plain shaft bearings
	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/other goods used to transmit power
	870840	Transmissions for motor vehicles
	870893	Clutches and parts for motor vehicles
the Other Auto Parts	870899	Motor vehicle parts nes
Motorcycles	871110	Motorcycles with reciprocating piston engine displacing 50 cc or less
	871120	Motorcycles with reciprocating piston engine displacing > 50 cc to 250 cc
	871130	Motorcycles with reciprocating piston engine displacing > 250 cc to 500 cc
	871140	Motorcycles with reciprocating piston engine displacing > 500 cc to 800 cc
	871150	Motorcycles with reciprocating piston engine displacing more than 800 cc
	871190	Motorcycles with other than a reciprocating piston engine
Motorcycle 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

Appendix Table 3. List of the 64 Countries Used in the Regression Analysis

East Asia			
JAPAN	KOREA REP.	CHINA	HONG KONG
AFTA			
SINGAPORE	THAILAND	MALAYSIA	PHILIPPINES
INDONESIA			
Other Asia			
INDIA	SRI LANKA	OMAN	ISRAEL
JORDAN			
Oceania			
AUSTRALIA	NEW ZEALAND		
EU			
SWEDEN	UNTD KINGDOM	IRELAND	NETHERLANDS
BELGIUM-LUX	FRANCE	GERMANY	PORTUGAL
SPAIN	ITALY	FINLAND	AUSTRIA
GREECE			
Other Europe			
NORWAY	POLAND	RUSSIAN FED	HUNGARY
ROMANIA	BULGARIA	CYPRUS	TURKEY
CZECH REP			
NAFTA			
CANADA	USA, PR, USVI	MEXICO	
MERCOSUR			
BRAZIL	URUGUAY	ARGENTINA	
Other Latin America			
GUATEMALA	HONDURAS	COSTA RICA	PANAMA
BARBADOS	COLOMBIA	VENEZUELA	PERU
BOLIVIA	CHILE		
Africa			
MOROCCO	TUNISIA	EGYPT	COTE D'IVOIRE
CAMEROON	GABON	ETHIOPIA	KENYA
MAURITIUS	SOUTH AFRICA		

Appendix Table 4. Regression Results: Tobit Regressions

	Dependent Variables			
	automobiles	*automobiles*	*auto parts*	*auto parts*
	GL2	GL2	GL2	GL2
	(1)	(2)	(3)	(4)
GDP	0.0558 ***	0.0556 ***	0.0366 ***	0.0365 ***
	(8.39)	(8.34)	(8.13)	(11.50)
DGDP	-0.1834 ***	-0.1823 ***	-0.0903 ***	-0.0900 ***
	(-9.23)	(-9.16)	(-6.33)	(-8.99)
DGDPPC	-0.3931 ***	-0.3907 ***	-0.0679	-0.0674 *
	(-4.30)	(-4.27)	(-1.13)	(-1.75)
SqDGDPPC	0.4214 **	0.4177 **	-0.1136	-0.1140
	(2.50)	(2.47)	(-1.06)	(-1.30)
DIST	-0.0510 ***	-0.0509 ***	-0.0526 ***	-0.0526 ***
	(-8.11)	(-8.08)	(-12.07)	(-17.24)
ADJ	0.1105 ***	0.1106 ***	0.0747 ***	0.0747 ***
	(5.31)	(5.31)	(4.55)	(6.37)
EXR	0.0436 ***	0.0430 ***	0.0160 **	0.0157 ***
	(4.33)	(4.27)	(2.52)	(3.63)
AUTO	0.5512 **	0.5724 ***	0.2768 *	0.2840 ***
	(2.57)	(2.67)	(1.86)	(2.59)
AFTA	0.0023	-0.0337	0.0555	0.0597 ***
	(0.03)	(-0.86)	(1.08)	(2.85)
NAFTA	0.0438	0.0459	0.1422	0.1787 ***
	(0.36)	(0.65)	(1.30)	(4.01)
EU	0.0724 ***	0.0286 *	0.0220	-0.0036
	(2.97)	(1.76)	(1.09)	(-0.41)
MERCOSUR	0.2484 **	0.2568 ***	0.2174 **	0.1785 ***
	(2.50)	(4.42)	(2.43)	(4.85)
AFTA_TR	-0.0140		0.0017	
	(-0.62)		(0.10)	
NAFTA_TR	0.0010		0.0146	
	(0.02)		(0.41)	
EU_TR	-0.0177 **		-0.0103 *	
	(-2.40)		(-1.67)	
MERCOSUR_TR	0.0033		-0.0156	
	(0.10)		(-0.54)	
D1997	0.0118	0.0082	0.0018	0.0006
	(0.70)	(0.49)	(0.15)	(0.22)
D1998	0.0091	0.0022	0.0295 **	0.0270 ***
	(0.54)	(0.13)	(2.50)	(3.32)
D1999	0.0238	0.0134	0.0340 ***	0.0303 ***
	(1.37)	(0.80)	(2.83)	(3.76)
D2000	0.0452 **	0.0316 *	0.0475 ***	0.0426 ***
	(2.58)	(1.91)	(3.92)	(5.17)
D2001	-0.0059	-0.0232	-0.0134	-0.0196 **
	(-0.32)	(-1.37)	(-1.07)	(-2.37)
_cons	-0.9608 ***	-0.9483 ***	-0.3199 ***	-0.3148 ***
	(-6.05)	(-5.97)	(-2.91)	(-4.02)
Number of obs	2566	2566	4032	4032
LR	470.61 ***	464.55 ***	543.55 ***	540.30 ***
Pseudo R-squared	0.3784	0.3736	1.1552	1.1483
Dep. Var. <=0	601	601	469	469
Dep. Var. >=1	1	1	0	0

Notes: The numbers in parentheses are t-statistics.
*significant at 10% level, ** significant at 5% level, ***significant at 1% level (two-tailed test)
Source: Authors' calculations.

Appendix Table 5.1. Matrices of the Shares of Each Trade Type for Major East Asian Countries and Regions, Automobile Parts in 1996 (%)

		KOR	CHN	THA	MAL	PHI	IND	E ASIA	ASEAN	EU	NAFTA	MRCSR
JPN	OWT	65.82	69.54	96.94	81.75	36.31	95.34	77.20	87.29	55.30	71.52	77.76
	HIIT	2.12	7.23	0.48	0.00	0.53	0.00	2.14	0.32	5.48	5.04	0.00
	VIIT	32.06	23.23	2.58	18.25	63.16	4.66	20.66	12.39	39.22	23.44	22.24
	GL1	29.16	68.04	8.74	45.35	97.52	10.77	27.42	23.56	34.79	20.49	30.29
	GL2	14.38	23.56	6.09	14.51	21.57	5.30	11.28	8.51	23.92	17.47	10.76
KOR	OWT		47.80	92.34	72.94	90.49	73.24	69.61	83.91	65.51	49.30	54.56
	HIIT		0.73	0.00	21.53	0.00	0.00	3.24	2.85	10.65	5.06	1.56
	VIIT		51.47	7.66	5.53	9.51	26.76	27.15	13.24	23.84	45.64	43.88
	GL1		85.46	81.25	58.46	8.96	57.62	33.31	51.89	52.40	95.74	61.89
	GL2		52.49	15.95	19.29	7.67	21.41	17.29	15.53	19.80	30.88	25.34
CHN	OWT			67.53	39.98	70.47	86.56	47.11	66.22	83.93	67.31	99.95
	HIIT			0.00	0.00	0.00	0.00	2.32	0.00	1.26	0.67	0.00
	VIIT			32.47	60.02	29.53	13.44	50.57	33.78	14.81	32.02	0.05
	GL1			38.74	50.08	33.33	16.97	55.03	38.27	43.57	34.16	12.64
	GL2			18.61	44.90	27.86	14.26	24.89	24.81	9.57	19.74	0.35
THA	OWT				70.85	98.12	50.87	39.32	86.79	70.18	76.45	100.00
	HIIT				0.00	0.04	0.00	6.45	0.14	0.09	9.67	0.00
	VIIT				29.15	1.84	49.13	54.23	13.07	29.73	13.88	0.00
	GL1				84.21	41.18	96.96	11.14	62.50	34.53	46.38	58.73
	GL2				35.13	11.75	52.63	6.97	24.06	16.78	14.54	1.72
MAL	OWT					91.67	42.76	60.97	73.86	88.19	82.96	n.a.
	HIIT					0.00	1.79	1.47	0.45	0.06	0.00	n.a.
	VIIT					8.33	55.45	37.56	25.69	11.75	17.04	n.a.
	GL1					97.44	31.60	47.42	65.23	65.42	29.81	2.36
	GL2					74.36	17.41	21.08	32.04	11.98	12.55	2.36
PHI	OWT						81.22	72.96	95.49	95.59	90.42	n.a.
	HIIT						0.00	3.80	0.03	0.22	0.00	n.a.
	VIIT						18.78	23.24	4.48	4.19	9.58	n.a.
	GL1						42.54	91.95	47.41	20.35	19.49	n.a.
	GL2						18.65	21.39	19.41	9.23	8.15	n.a.
IND	OWT							80.65	64.76	85.15	84.09	100.00
	HIIT							0.52	0.10	0.00	0.00	0.00
	VIIT							18.83	35.14	14.85	15.91	0.00
	GL1							11.82	43.50	62.47	64.41	13.39
	GL2							5.75	22.90	10.92	9.88	13.39
E ASIA	OWT							58.00	63.86	71.48	56.36	93.91
	HIIT							6.33	2.57	6.61	2.93	0.21
	VIIT							35.67	33.57	21.91	40.71	5.88
	GL1							30.61	28.21	40.84	28.25	18.68
	GL2							13.94	11.17	20.62	18.52	4.58
ASEAN	OWT								86.11	84.10	83.28	100.00
	HIIT								0.14	0.09	3.05	0.00
	VIIT								13.75	15.81	13.67	0.00
	GL1								56.69	54.20	38.42	27.21
	GL2								24.91	13.13	11.53	4.76
EU	OWT									22.90	24.10	59.64
	HIIT									15.69	10.80	10.55
	VIIT									61.41	65.10	29.81
	GL1									65.37	57.87	38.48
	GL2									42.83	38.56	21.88
NAFTA	OWT										14.62	13.71
	HIIT										40.63	4.33
	VIIT										44.75	81.97
	GL1										76.80	59.68
	GL2										57.38	35.77
MRCSR	OWT											18.96
	HIIT											34.50
	VIIT											46.54
	GL1											70.26
	GL2											43.57

Source: PC-TAS 1996-2000, 1997-2001

Appendix Table 5.2. Matrices of the Shares of Each Trade Type for Major East Asian Countries and Regions, Automobile Parts in 2001 (%)

		KOR	CHN	THA	MAL	PHI	IND	E ASIA	ASEAN	EU	NAFTA	MRCSR
JPN	OWT	60.02	69.80	80.95	84.38	60.25	87.41	68.03	79.66	52.64	64.21	92.05
	HIIT	1.42	0.94	0.01	0.34	22.91	0.56	2.00	4.18	9.09	5.32	0.64
	VIIT	38.56	29.26	19.04	15.28	16.84	12.03	29.97	16.16	38.27	30.47	7.31
	GL1	38.39	70.08	44.93	73.69	72.03	38.75	51.20	49.95	33.65	21.79	11.15
	GL2	21.12	19.82	16.43	12.09	19.17	11.49	17.27	15.01	23.40	19.62	6.83
KOR	OWT		31.18	27.87	13.37	63.10	92.19	50.67	46.66	57.90	46.46	64.01
	HIIT		0.36	0.00	8.85	0.00	0.00	1.84	4.31	5.02	0.07	0.00
	VIIT		68.46	72.13	77.78	36.90	7.81	47.49	49.03	37.08	53.47	35.99
	GL1		95.13	67.77	78.28	78.67	14.52	48.31	54.30	54.04	53.43	21.36
	GL2		33.03	21.61	25.93	21.92	4.60	23.17	17.41	23.61	32.46	20.34
CHN	OWT			42.45	37.15	87.77	38.37	40.27	49.85	67.19	72.70	86.43
	HIIT			0.11	0.00	0.00	0.00	0.46	0.03	2.91	0.91	0.35
	VIIT			57.44	62.85	12.23	61.63	59.27	50.12	29.90	26.39	13.21
	GL1			59.42	92.63	79.42	72.59	63.22	75.95	46.33	27.43	23.16
	GL2			31.48	39.31	19.48	59.31	21.51	36.13	17.86	13.98	6.09
THA	OWT				20.25	46.76	29.94	46.79	31.70	86.73	60.32	100.00
	HIIT				13.48	0.00	1.25	8.01	6.01	1.18	0.00	0.00
	VIIT				66.27	53.24	68.81	45.20	62.28	12.09	39.68	0.00
	GL1				54.03	40.61	89.74	46.34	58.38	40.18	34.66	79.19
	GL2				39.63	21.70	48.62	18.41	36.00	10.40	15.69	2.01
MAL	OWT					52.61	19.81	40.70	23.88	75.90	74.23	47.73
	HIIT					1.48	0.00	13.24	8.88	0.87	0.10	0.00
	VIIT					45.91	80.19	46.06	67.24	23.23	25.67	52.27
	GL1					59.02	55.32	64.59	54.79	49.38	26.36	51.93
	GL2					47.66	26.32	23.87	36.87	14.85	11.90	51.93
PHI	OWT						37.50	52.28	46.16	97.42	87.80	48.03
	HIIT						0.00	0.00	0.23	1.01	0.10	26.38
	VIIT						62.50	47.72	53.62	1.57	12.10	25.59
	GL1						91.10	69.52	49.77	21.12	9.51	56.71
	GL2						58.12	20.29	29.93	10.39	7.91	56.71
IND	OWT							64.07	27.96	92.22	79.69	69.03
	HIIT							7.18	0.62	0.64	1.37	0.00
	VIIT							28.75	71.42	7.14	18.94	30.97
	GL1							40.94	77.52	49.66	68.19	44.79
	GL2							13.36	41.78	10.31	17.08	9.53
E ASIA	OWT							44.77	51.30	64.08	62.42	83.17
	HIIT							7.41	8.54	3.94	1.03	0.30
	VIIT							47.82	40.16	31.98	36.55	16.52
	GL1							50.11	52.48	39.74	25.75	15.85
	GL2							18.98	19.63	20.59	19.59	7.18
ASEAN	OWT								31.82	87.82	77.13	81.28
	HIIT								4.69	0.99	0.35	2.98
	VIIT								63.49	11.19	22.52	15.74
	GL1								59.51	42.38	31.94	65.62
	GL2								36.25	11.57	12.75	7.23
EU	OWT									24.28	26.62	41.19
	HIIT									18.59	1.28	23.14
	VIIT									57.13	72.10	35.66
	GL1									64.75	57.37	59.70
	GL2									43.21	38.06	36.36
NAFTA	OWT										5.79	22.65
	HIIT										32.08	0.94
	VIIT										62.13	76.41
	GL1										84.77	64.24
	GL2										63.63	37.61
MRCSR	OWT											15.78
	HIIT											31.32
	VIIT											52.91
	GL1											71.63
	GL2											49.46

Source: PC-TAS 1996-2000, 1997-2001

Appendix Table 5.3. Matrices of the Shares of Each Trade Type for Major East Asian Countries and Regions, Automobiles in 1996 (%)

		KOR	CHN	THA	MAL	PHI	IND	E ASIA	ASEAN	EU	NAFTA	MRCSR
JPN	OWT	88.11	99.87	99.72	100.00	99.56	100.00	99.75	99.79	38.15	10.88	100.00
	HIIT	0.00	0.00	0.23	0.00	0.00	0.00	0.03	0.05	16.51	63.85	0.00
	VIIT	11.89	0.13	0.05	0.00	0.44	0.00	0.22	0.16	45.34	25.27	0.00
	GL1	54.36	0.76	1.20	0.04	1.18	2.87	0.91	0.60	74.31	22.78	0.66
	GL2	18.64	0.76	1.20	0.04	1.07	2.87	0.53	0.60	34.12	22.20	0.66
KOR	OWT		100.00	100.00	100.00	100.00	100.00	100.00	100.00	64.06	99.82	n.a.
	HIIT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	n.a.
	VIIT		0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.94	0.18	n.a.
	GL1		1.68	0.00	0.00	0.12	0.00	13.76	0.09	44.05	17.14	n.a.
	GL2		0.62	0.00	0.00	0.12	0.00	4.75	0.09	21.86	6.58	n.a.
CHN	OWT				n.a.	100.00	n.a.	98.63	100.00	99.31	99.48	n.a.
	HIIT				n.a.	0.00	n.a.	0.00	0.00	0.00	0.07	n.a.
	VIIT				n.a.	0.00	n.a.	1.37	0.00	0.69	0.45	n.a.
	GL1				n.a.	0.00	n.a.	1.23	0.00	1.04	0.36	n.a.
	GL2				n.a.	0.00	n.a.	0.88	0.00	1.04	0.36	n.a.
THA	OWT				100.00	100.00	n.a.	98.10	100.00	91.65	100.00	n.a.
	HIIT				0.00	0.00	n.a.	1.33	0.00	0.00	0.00	n.a.
	VIIT				0.00	0.00	n.a.	0.57	0.00	8.35	0.00	n.a.
	GL1				8.02	0.31	n.a.	1.24	1.16	10.93	0.00	n.a.
	GL2				0.62	0.31	n.a.	1.21	0.34	1.04	0.00	n.a.
MAL	OWT						100.00	81.34	100.00	84.93	100.00	n.a.
	HIIT						0.00	0.00	0.00	0.00	0.00	n.a.
	VIIT						0.00	18.66	0.00	15.07	0.00	n.a.
	GL1						0.21	1.72	0.53	40.71	0.00	n.a.
	GL2						0.00	1.58	0.03	11.27	0.00	n.a.
PHI	OWT							97.58	100.00	100.00	n.a.	n.a.
	HIIT							0.00	0.00	0.00	n.a.	n.a.
	VIIT							2.42	0.00	0.00	n.a.	n.a.
	GL1							1.84	0.31	0.00	n.a.	n.a.
	GL2							1.67	0.31	0.00	n.a.	n.a.
IND	OWT							93.05	100.00	71.65	n.a.	n.a.
	HIIT							6.95	0.00	28.35	n.a.	n.a.
	VIIT							0.00	0.00	0.00	n.a.	n.a.
	GL1							2.20	0.21	5.52	n.a.	n.a.
	GL2							2.18	0.00	2.40	n.a.	n.a.
E ASIA	OWT							79.65	88.85	74.61	99.72	100.00
	HIIT							0.00	0.54	0.00	0.00	0.00
	VIIT							20.35	10.61	25.39	0.28	0.00
	GL1							2.10	1.59	65.05	22.21	0.07
	GL2							1.20	1.49	32.30	20.85	0.07
ASEAN	OWT								100.00	86.09	100.00	n.a.
	HIIT								0.00	0.41	0.00	n.a.
	VIIT								0.00	13.50	0.00	n.a.
	GL1								0.47	24.05	0.00	n.a.
	GL2								0.09	5.75	0.00	n.a.
EU	OWT									23.96	38.62	74.40
	HIIT									42.27	0.00	11.19
	VIIT									33.77	61.38	14.41
	GL1									63.00	24.61	34.09
	GL2									42.31	16.23	18.80
NAFTA	OWT										2.56	100.00
	HIIT										75.63	0.00
	VIIT										21.81	0.00
	GL1										41.92	0.83
	GL2										38.62	0.83
MRCSR	OWT											17.93
	HIIT											75.50
	VIIT											6.57
	GL1											68.35
	GL2											42.52

Source: PC-TAS 1996-2000, 1997-2001

Appendix Table 5.4. Matrices of the Shares of Each Trade Type for Major East Asian Countries and Regions, Automobiles in 2001 (%)

		KOR	CHN	THA	MAL	PHI	IND	E ASIA	ASEAN	EU	NAFTA	MRCSR
JPN	OWT	88.74	99.84	12.15	100.00	100.00	98.99	99.37	88.22	43.25	97.89	99.85
	HIIT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	1.15	0.00
	VIIT	11.26	0.16	87.85	0.00	0.00	1.01	0.63	11.78	56.63	0.96	0.15
	GL1	56.55	0.51	85.28	0.12	0.76	3.92	14.15	22.43	50.40	5.49	0.18
	GL2	48.60	0.51	69.18	0.12	0.76	3.22	11.70	18.22	34.12	4.60	0.11
KOR	OWT		99.90	n.a.	n.a.	97.90	100.00	99.93	99.86	79.98	99.52	n.a.
	HIIT		0.00	n.a.	n.a.	0.00	0.00	0.00	0.00	0.00	0.01	n.a.
	VIIT		0.10	n.a.	n.a.	2.10	0.00	0.07	0.14	20.02	0.47	n.a.
	GL1		1.74	n.a.	n.a.	6.56	0.00	24.70	0.73	28.09	1.22	n.a.
	GL2		1.33	n.a.	n.a.	3.13	0.00	21.11	0.35	14.40	0.93	n.a.
CHN	OWT			100.00	n.a.	61.29	n.a.	99.07	61.29	100.00	94.07	n.a.
	HIIT			0.00	n.a.	0.00	n.a.	0.00	0.00	0.00	0.00	n.a.
	VIIT			0.00	n.a.	38.71	n.a.	0.93	38.71	0.00	5.93	n.a.
	GL1			0.00	n.a.	67.07	n.a.	1.06	9.59	1.39	7.23	n.a.
	GL2			0.00	n.a.	53.85	n.a.	0.83	7.70	1.36	6.37	n.a.
THA	OWT				100.00	100.00	n.a.	36.49	100.00	100.00	100.00	n.a.
	HIIT				0.00	0.00	n.a.	0.00	0.00	0.00	0.00	n.a.
	VIIT				0.00	0.00	n.a.	63.51	0.00	0.00	0.00	n.a.
	GL1				20.22	17.33	49.30	75.90	31.53	14.34	70.66	n.a.
	GL2				19.81	17.33	49.30	61.37	31.46	2.31	1.08	n.a.
MAL	OWT						32.99	42.53	65.29	83.37	92.86	n.a.
	HIIT						0.00	0.00	0.00	16.63	7.14	n.a.
	VIIT						67.01	57.47	34.71	0.00	0.00	n.a.
	GL1						33.96	0.30	23.25	33.01	0.00	n.a.
	GL2						6.04	0.25	16.77	12.93	0.00	n.a.
PHI	OWT							97.38	99.60	n.a.	n.a.	n.a.
	HIIT							0.00	0.00	n.a.	n.a.	n.a.
	VIIT							2.62	0.40	n.a.	n.a.	n.a.
	GL1							3.18	17.33	n.a.	n.a.	n.a.
	GL2							2.63	17.33	n.a.	n.a.	n.a.
IND	OWT							75.31	43.95	96.00	n.a.	n.a.
	HIIT							2.05	0.00	0.00	n.a.	n.a.
	VIIT							22.64	56.05	4.00	n.a.	n.a.
	GL1							6.05	47.57	0.14	n.a.	n.a.
	GL2							5.39	44.42	0.00	n.a.	n.a.
E ASIA	OWT							95.18	58.89	87.26	99.37	99.73
	HIIT							0.00	0.56	0.00	0.01	0.00
	VIIT							4.82	40.55	12.74	0.62	0.27
	GL1							10.03	21.65	41.89	4.80	0.18
	GL2							8.23	17.57	27.49	4.00	0.10
ASEAN	OWT								94.47	85.44	99.97	n.a.
	HIIT								0.00	14.16	0.03	n.a.
	VIIT								5.53	0.40	0.00	n.a.
	GL1								31.66	16.97	65.02	n.a.
	GL2								30.15	3.83	0.99	n.a.
EU	OWT									28.23	20.60	79.44
	HIIT									29.50	35.40	0.00
	VIIT									42.27	44.00	20.56
	GL1									56.01	20.05	33.50
	GL2									36.39	14.47	13.53
NAFTA	OWT										2.52	100.00
	HIIT										73.92	0.00
	VIIT										23.56	0.00
	GL1										42.57	22.58
	GL2										38.43	17.63
MRCSR	OWT											25.48
	HIIT											37.61
	VIIT											36.90
	GL1											52.63
	GL2											33.21

Source: PC-TAS 1996-2000, 1997-2001