The Impact of Regional Integration Schemes on the Automobile and Autoparts Trade

Aparecida Mitsue MITUIASSU

Abstract

In the 1990s globalization and the increasing interdependence of the world economies brought many challenges for automobile and autoparts companies. They were forced to adopt new international strategies in order to survive in the increasingly competitive global market. At the same time, the appearance of regional integration schemes also created many opportunities for automobile and autoparts companies and became an important factor in the strategy of these multinational corporations. These two processes, globalization and regionalization, had a large influence on companies' decisions in terms of investments, production and trade. In this paper, the focus of the analysis will be on the effect of regional integration schemes on automobile and autoparts trade.

I. Introduction

The 1990s was a decade of great changes in the world automobile and autoparts industries. The globalization process and the increasing interdependence of economies increased world competition and companies were forced to reduce costs, improve production processes and technologies in order to maintain their presence in world markets. At the same time, due to the proliferation of regional integration schemes　new regional integration attempts and/or the resurgence or deepening of old ones , automobile and autoparts companies also concentrated their activities in regions as part of their new global strategies. In addition, developing countries played an important role in the automobile and autoparts companies' international strategies, becoming not only potential consumers but also new production poles. All these factors were very important for automobile and autoparts companies and had a large impact on their investment decisions, production and trade.

The objective of this paper is to show the impact of regional integration schemes on the world automobile and autoparts' trade. This paper tries to show that the formation of regional integration schemes has greatly influenced the strategy of automobile and autoparts companies and that they have increasingly taken advantage of the expanded markets. The paper will be divided into four sections. The first one is this introduction. The second section describes the globalization and regionalization trends of automobile and autoparts industries in the 1990s and the growing importance of developing countries for automobile companies. In the third section, an analysis based on a gravity model shows the impact of regional integration schemes on the trade flow of automobiles and autoparts. The last section presents the concluding remarks.

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II. The Automobile and Autoparts Industries in the 1990s - Globalization and Regionalization Trends and the Growing Importance of Developing Countries

2.1 Globalization and Regionalization - Changes in the Automobile and Autoparts Industries

In the 1990s, the biggest challenge for automobile companies became how to organize themselves internationally due to the increasing interdependence and competition of the world economy. A large number of mergers and acquisitions occurred between automobile companies as a way of overcoming the new competitive game brought about by the globalization process . According to the World Investment Report 2000 , the automobile sector constituted one of the leading industries in the manufacturing sector in terms of worldwide cross-border mergers and acquisitions. These mergers and acquisitions were mainly horizontal between firms in the same industry and aimed at achieving economies of scale, synergy of technologies, increasing market power, eliminating excess capacity or consolidating innovation strategies. As a result, especially in the second half of the 1990s, there was a huge intensification of cross-border mergers and acquisitions among automobile companies in the world.

The proliferation of regional integration schemes created new opportunities for production and trade as automobile and autoparts companies benefited from intra-regional tariff reductions and expansion of the market. In the case of automobiles, although the strategies and the degree of regionalization varied from company to company and by country of origin, there is much evidence that, based on a global strategy, companies took into consideration the proliferation of regional integration schemes. The internationalization of the automobile companies and the regionalization of their activities were based on two main strategies: 1 maintaining proximity to potential markets and 2 guaranteeing their presence in order to supply the domestic markets and avoid possible imposition of trade regulations and protectionism measures Tigre et al., 2000, p.14 . As a result of the globalization and regionalization processes, the automobile companies reorganized and rationalized their production, reduced the number of plants and specialized their production around the world in the 1990s.

The new international strategies adopted by the automobile multinational corporations also greatly affected the world autoparts industry. On one hand, automobile companies started looking for autoparts suppliers around the world that could offer the best combination of quality and price in order to reduce their costs. This new strategy, called "*global sourcing*", imposed many challenges for the autoparts industry in both developed and developing countries. On the other hand, due to the incorporation of the Japanese production system *Just-in-time, Kanban* into automobile production processes, autoparts suppliers were required to be close to the assembling companies. As a result, large multinational autoparts corporations followed the automobile companies in a process that is

called "*follow sourcing*".

In order to face the globalization process and the growing competition, the autoparts multinational companies also had to make strategic alliances through the formation of joint ventures, mergers and acquisitions. The main motives for these alliances were to benefit from economies of scale, technology transfer and organizational know-how, and reduce costs in R&D, among others. Consequently, the number of autoparts companies declined and the concentration among a few global suppliers increased.

In developing countries, the domestic autoparts companies were also affected by the changes in the world automobile and autoparts industries. In order to face the foreign competition and to fill the technological gap, many domestic autoparts companies were forced to establish joint ventures with foreign ones. In the 1990s, a large number of mergers and acquisitions occurred between foreign and domestic autoparts companies. In addition, due to the opening of the economies and the introduction of tariff reductions, developing countries autoparts companies were exposed to more foreign competition.

Regional integration schemes also played an important role in the activities of autoparts companies. The intra-regional tariff reductions allowed the exchange of autoparts within the integrated market and also attracted many foreign autoparts companies that allocated plants strategically within the regions. In the 1990s, due to the increasing "global sourcing" strategies of automobile companies, there was also an increase in autoparts trade between countries of different regions. All these factors caused a large restructuring in the autoparts industries, especially in developing countries, with an increase in the number of foreign owned autoparts companies.

2.2 Automobile Production and Sales - The Growing Importance of Developing Countries

The stagnation of demand for automobiles in many developed countries at the beginning of the 1990s and the consequent necessity of guaranteeing a share in the world markets led multinational automobile companies to search for new markets. In developing countries, the automobile and autoparts companies found favorable conditions to invest due to the opening of the economies, implementation of import tariff reductions, deregulation of investment rules, privatization, and the increasing demand for automobiles. In addition, many developing countries joined regional integration attempts, creating new opportunities for automobile companies. As a result, many developing countries became important destinations for automobile companies foreign direct investment in the 1990s. As can be seen in table 1, whereas in 1988 the total FDI inward stock of the automobile sector in developing countries accounted for US$5,978 million, in 1999 it increased to US$12,595 million. In the case of Latin American countries, the FDI inward stock increased from US$4,655 million in 1988 to US$7,658 million in 1999. As for Asia, it increased from US$1,180 million in 1988 to US$4,744 million in 1999. In 1999, the FDI inward stock of the countries of Central and Eastern Europe was US$5,642

Table 1. Automobile Industry's FDI Inward Stocks

US$ million

	1988	1999
Developed Countries	10,236	92,338
Developing Countries	5,978	12,595
Africa	-	-
Asia	1,180	4,744
Latin America	4,655	7,658
Central & Eastern Europe	-	5,642
World Total	16,214	110,575

Source : World Investment Report - 2000

million .

The large flow of foreign direct investment in developing countries was the result of the global reorganization and rationalization of production by automobile companies around the world. As a result, many countries became important platforms of production. Table 2 shows the world production shares and growth rates of automobile production in selected developing countries. Compared to the beginning of the 1990s, many developing countries showed increasing shares in world automobile production and high growth rates during the decade. It is worth noting that the fluctuations in automobile production were highly affected by business cycles and the financial crises that occurred in the 1990s such as the Mexican crisis in 1994 and the Asian crisis in 1997 . Mexico became an important producer of automobiles and with the formation of NAFTA in 1994, the Mexican automobile industry became more integrated with the North American market. Brazil and Argentina also became important producers of automobiles in the 1990s. The automobile industry in these countries experienced great changes in the 1990s and received massive inflows of foreign direct investment. One of the most important factors that led to the increasing flow of foreign investment into Argentina and Brazil was the formation of Mercosur, which allowed a deeper integration of the two countries' automobile industries. Asian countries Taiwan, Thailand, Malaysia, Indonesia, Philippines and India, excluding Japan and Korea also became important producers of automobiles in the 1990s. These countries had a limited production of automobiles in the 1980s. However, in the 1990s, production of automobiles increased dramatically due to the large presence of Japanese companies in Asian countries and to the expansion of Korean firms. In the case of China, the production of automobiles also increased sharply in the 1990s, because of its large and potential domestic market.

In the 1990s, automobile multinational companies were also attracted by the increasing demand in the developing countries. Investments were made with the aim of taping the domestic market potentials, as there was still room for expansion. Table 3 shows the shares in world automobile sales and the growth rates of domestic sales in selected developing countries. In these countries, demand

Table 2 Automobile Production of Selected Developing Countries

Countries/Year	1990		1991		1992		1993		1994		1995		1996		1997		1998*		1999*		2000*	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Mexico	1.7	28.0	2.1	20.6	2.2	9.2	2.2	0.0	2.2	3.9	1.8	1.8	2.3	30.4	2.4	11.4	2.6	4.0	2.8	2.5	2.7	1.2
Brazil	1.9	-10.0	2.0	5.0	2.2	11.8	2.9	29.6	3.1	13.7	3.2	3.2	3.4	10.8	3.7	14.6	2.9	-23.9	3.1	4.3	3.4	11.6
Argentina	0.2	-22.0	0.3	39.5	0.5	88.6	0.7	30.7	0.8	19.4	0.6	0.6	0.6	9.7	0.8	42.4	0.8	-1.3	0.7	-18.2	0.8	19.4
China	1.1	-13.0	1.5	39.2	2.2	49.8	2.7	22.1	2.7	4.4	2.8	2.8	2.8	1.5	2.8	7.3	2.9	0.1	3.0	0.6	3.2	6.0
Other Asian	3.1	25.0	3.2	1.1	2.9	-6.0	3.5	17.3	3.9	18.2	4.6	4.6	4.8	6.6	4.4	-2.9	2.5	-45.4	3.0	15.7	3.6	23.3
WORLD	48,376,393		47,344,170		48,378,482		48,048,475		50,573,635		51,376,062		52,875,496		55,846,393		53,794,028		52,466,500		53,285,500	

* forecast

a - shares   b - growth rates

Note: Other Asian countries in the table are Thailand, Malaysia, Indonesia, Philippines and India.

Source: FOURIN Sekai Jidousha Forecast - 1998/1999

Table 3 Automobile Sales of Selected Developing Countries

Countries/Year	1990		1991		1992		1993		1994		1995		1996		1997		1998*		1999*		2000*	
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
Mexico	1.3	23.0	1.6	16.9	1.7	10.0	1.5	-14.6	1.4	3.4	0.4	-69.7	0.7	80.3	1.1	47.9	1.3	19.2	1.2	-10.0	1.3	9.3
Brazil	1.7	-6.0	1.9	8.8	1.8	-2.6	2.7	46.6	3.1	21.6	3.7	22.8	3.7	2.1	4.0	12.2	3.2	-22.2	3.1	-5.1	3.9	25.0
Argentina	0.2	-28.0	0.4	72.8	0.8	110.6	1.0	20.5	1.2	20.7	0.7	-35.5	0.8	14.7	0.9	13.3	1.0	4.4	0.8	-21.3	0.9	20.0
China	NA	NA	NA	NA	2.3	--	2.8	20.0	3.0	14.1	3.2	7.8	3.2	1.1	3.3	7.4	3.5	0.9	3.6	0.6	3.7	5.0
Other Asian	3.9	24.0	3.9	-2.8	3.9	2.5	4.5	13.5	4.9	16.1	5.7	18.2	5.8	4.7	5.4	-4.8	3.4	-39.8	3.3	-4.2	4.0	25.2
WORLD	41,938,942		40,434,158		42,055,025		41,291,315		44,010,597		44,437,166		46,256,716		47,109,424		45,610,747		44,578,000		45,340,000	

* forecast

a - shares   b - growth rates

Note: Other Asian countries in the table are Thailand, Malaysia, Indonesia, Philippines and India.

Source: FOURIN Sekai Jidousha Forecast - 1998/1999

for automobiles increased sharply. There was also an increasing share in world automobile sales, which reflected the increase in production and the opening of the economies. The market was, however, highly affected by the financial crises that occurred in the 1990s, as mentioned before.

As observed, many developing countries played an important role in the globalization of automobile companies and became not only consumers but also important producers of automobiles.

III. The Automobile and Autoparts Trade - A Gravity Model based on a Cross-Section Analysis

In order to evaluate the effect of regional integration schemes on the trade flows of automobile and autoparts, a quantitative analysis based on a gravity model is presented in this section. Gravity models have been used in Economics as an empirical tool to analyze trade flows between countries. They have also been widely used to identify the effects of regional integration schemes on trade flows between countries . Recent studies using gravity models have been applied to assess the impact of new integration schemes such as in the study of Frankel, Stein and Wei's 1995 , where integration dummies were applied to Mercosur, APEC, the Andean Group in addition to the EU, EFTA and NAFTA . Piane and Kume 2000 also applied a gravity model including dummies for the Andean Group, Anzcer, Asean, Mercosur, NAFTA and the EU for the period 1986-1997 .

The following subsection presents the cross-section gravity model used to analyze the trade flows of automobiles and autoparts for 23 countries and the impact of regional integration schemes.

3.1 The Model

The following gravity equation gives the impact of selected variables on the total trade in automobiles and autoparts . The estimation method used in this analysis was based on the Ordinary Least Square OLS method.

$$Log(TTij) = \alpha_0 + \alpha_1 \log GDPi + \alpha_2 \log GDPj + \alpha_3 \log Distij + \alpha_4 DMerc + \alpha_5 DEU + \alpha_6 DNAFTA$$
$$+ \alpha_7 TDMerc + \alpha_8 TDEU + \alpha_9 TDNAFTA + error$$

where,

TTij is the total trade between two countries bilateral trade in current US dollars FOB

GDPi is the GDP of country i in current US dollars;

GDPj is the GDP of country j in current US dollars;

Distij is the distance in kilometers between the capitals of two countries;

DMerc is a dummy variable for Mercosur member countries. It takes the value of 1 when two countries belong to Mercosur regional integration and O otherwise.

DEU is a dummy variable for European Union members. It takes the value of 1 when two countries belong to EU and O otherwise.

DNAFTA is a dummy variable for NAFTA member countries. It takes the value of 1 when two countries belong to NAFTA and 0 otherwise.

TDMerc is a dummy variable for trade diversion in Mercosur countries. It takes the value of 1 when either country i or country j are members of Mercosur and 0 if countries i and j belong to Mercosur or do not belong to any integration scheme included in the model.

TDEU is a dummy variable for EU countries' trade diversion. It takes the value of 1 when either country i or country j are members of the European Union and 0 if both countries i and j belong to the European Union or do not belong to any integration scheme included in the model.

TDNAFTA is a dummy variable for NAFTA countries' trade diversion. It takes the value of 1 when either country i or country j are members of NAFTA and 0 if both countries i and j belong to NAFTA or do not belong to any integration scheme included in the model.

Error: an error term capturing the joint effects of all omitted variables, measurement errors and random factors.

The dependent variable TTij is the total trade of a given pair of countries. Trade data used in this analysis was based on FOB exports values in current US dollars in order to avoid the effect of transportation costs and insurance included in the CIF values. Thus, TTij is the sum of exports of country i to country j or vice-versa. This means that the variable does not indicate the direction of trade from one country to the other, but represents the total trade of a given pair of countries.

The GDP of country i is used as a proxy for its potential export supply and income as well as for its economic power. On the other hand, the GDP of country j is a proxy reflecting the purchasing power of that partner country. Hence, a positive sign is expected for the coefficients $_1$ and $_2$.

The distance variable is used as a proxy for transportation costs and the degree of easy transportation between countries. Long distances between countries will tend to increase transport costs. In other words, transportation costs between countries that are geographically close are expected to be lower than for countries that are further apart. In addition, this variable is used as a proxy for natural barriers to trade and imperfect information about international markets. As a result, in this analysis, the distance coefficient is expected to be negative.

The equation contains two different categories of dummies. The first is related to trade among members of the same regional integration scheme (DMerc, DEU and DNAFTA). When two countries are members of the same regional integration scheme, the dummy takes the value "one". It takes the value "zero" when a given pair of countries does not belong to the same integration scheme. The regional integration dummies are expected to have positive signs as it is believed that trade flows of automobiles and autoparts are more intense between countries belonging to the same regional integration scheme.

The other group contains the trade diversion dummies. It distinguishes whether one trade partner,

either i or j is a member of a regional integration scheme and the other is not a member （TDMerc, TDEU and TDNAFTA）. It takes the value "one" when one of the countries belongs to a regional integration scheme and the partner is not a member and "zero" if both are members of the same regional integration scheme or if a pair of countries does not belong to any regional integration scheme included in the model. This methodology was used to capture the trade diversion effect and because the dependent variable （total trade between two countries） did not distinguish the direction of trade. The dummies for trade diversion （TDMerc, TDEU and TDNAFTA） are very important in this analysis. The hypothesis is that trade on automobiles and autoparts is concentrated among countries belonging to the same integration scheme and a priori, a negative coefficient is expected. Thus, if countries are trading more with countries belonging to a same integration scheme, the sign of the coefficient will be negative. These dummies can also capture changes and reduction in the trade diversion effect. The coefficients of these dummies can capture a situation where countries are trading more with non-member countries, which in this case, the sign will be positive.

3.2 The Data

The trade data used in this analysis were based on the Standard International Trade Classification - SITC, Revision 3, at the 3-digit level. The classifications used for automobiles were SITC 781, 782 and 783 and for autoparts SITC 784. The classifications SITC 781,782,783 were aggregated into one group. Export data were obtained from two sources: DataIntal 1.0 CD-ROM, from the Inter-American Development Bank - IDB and the United Nations COMTRADE Database. The countries included in the sample were European Union member countries （Austria, Belgium-Luxembourg, Germany, Denmark, Spain, Finland, France, United Kingdom, Italy, Netherlands, Portugal, Sweden）and Switzerland; Mercosur member countries （Argentina, Brazil and Uruguay）plus Chile and Venezuela; NAFTA member countries （Mexico, Canada and United States）; Japan and Korea; a total of 23 countries.

In order to investigate how the various coefficients change over time, in particular how they change before and after they join a particular integration scheme, the data set from 1988 to 1999 were divided into 4 periods: 1988/1990, 1991/1993, 1994/1996 and 1997/1999. In the first period, 1988-1990, only European countries were committed to regional integration schemes. In the case of Mercosur and NAFTA, member countries became committed to regional integration schemes following their official formation, which occurred in 1991 and 1994, respectively[10].

The GDP data from 1988 to 1999 were obtained from the World Bank "World Development Indicators - WDI, CD-ROM 1999". Data from 1995 to 1999 were also updated from the institutions web site. GDP at current US dollars were used. In each period, the average of 3 years GDP was calculated in order to avoid economic cycles and fluctuations.

Distance measured in kilometers between the capitals of two countries was used. It was obtained

Table 4
Gravity Model - Estimation Results for Automobile Trade

Variables	Period 1989/1990	Period 1991/1993	Period 1994/1996	Period 1997/1999
Constant	-26.17	-28.52	-28.20	-31.11
	-7.01	-9.96	-9.83	-10.60
log GDP$_i$	1.19	1.22	1.10	1.13
	8.05 *	10.03 *	9.44 *	10.14 *
log GDP$_j$	1.15	1.19	1.22	1.25
	12.02 *	14.57 *	15.07 *	16.13 *
log Dist$_{ij}$	-1.06	-0.79	-0.74	-0.54
	-6.20 *	-5.65 *	-5.76 *	-4.06 *
DMerc	1.16	0.98	1.92	2.30
	0.99	1.00	2.81 *	3.87 *
DEU	0.45	-0.78	0.06	0.68
	0.75	-1.40	0.11	1.26
DNafta	1.05	-0.36	0.96	1.00
	1.38	-0.62	1.65 ***	1.99 **
TDMerc	-0.97	-0.90	-0.14	-0.41
	-2.12 **	-2.38 *	-0.35	-1.15
TDEU	-0.68	-1.81	-0.97	-0.70
	-1.25	-4.16 *	-2.20 **	-1.68 ***
TDNafta	-1.07	-2.13	-1.88	-1.85
	-2.32 **	-5.60 *	-5.13 *	-5.46 *
Adjusted R^2	0.67	0.71	0.67	0.70
DW Stat	1.93	1.62	1.66	1.73
Sample	253	253	253	253

Note: t-statistics are shown in parentheses.

Estimations corrected with White Heteroskedasticity-

Consistent Standard Errors & Covariance .

* Significant at 1% level

** Significant at 5% level

*** Significant at 10% level

Table 5
Gravity Model - Estimation Results for Autoparts Trade

Variables	Period 1989/1990	Period 1991/1993	Period 1994/1996	Period 1997/1999
Constant	-31.14	-31.40	-34.49	-36.11
	-13.10	-12.84	-13.88	-13.87
log GDP$_i$	1.51	1.46	1.43	1.44
	17.56 *	16.49 *	17.14 *	16.20 *
log GDP$_j$	1.05	1.05	1.15	1.17
	14.79 *	15.75 *	16.67 *	16.92 *
log Dist$_{ij}$	-1.09	-0.95	-0.88	-0.75
	-7.45 *	-7.67 *	-7.51 *	-6.21 *
DMerc	1.89	2.06	3.14	3.15
	4.11 *	3.54 *	5.55 *	6.34 *
DEU	0.11	-0.10	1.20	1.47
	0.25	-0.21	2.62 *	3.37 *
DNafta	1.26	1.30	2.40	2.30
	2.07 **	2.48 *	4.88 *	5.23 *
TDMerc	-0.15	-0.21	0.41	0.38
	-0.48	-0.64	1.20	1.19
TDEU	-0.54	-0.88	-0.17	0.02
	-1.54	-2.38 *	-0.44	0.06
TDNafta	-0.36	-0.27	0.35	0.34
	-1.01	-0.83	1.26	1.26
Adjusted R^2	0.76	0.76	0.76	0.77
DW Stat	1.70	1.74	1.56	1.39
Sample	253	253	253	253

Note: t-statistics are shown in parentheses.

Estimations corrected with White Heteroskedasticity-

Consistent Standard Errors & Covariance .

* Significant at 1% level

** Significant at 5% level

*** Significant at 10% level

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from the "Centre D'Etudes Prospectives et D'Informations Internationales - CEPII" in France, at the web site http://www.cepii.fr.

The three-year average of each period for all changing variables was used in order to eliminate possible data fluctuation or business cycles. Each period contained 253 observations for all variables.

3.3 The Estimation Results

The estimations were made for automobiles and autoparts separately and the results are given in tables 4 and 5. The t-values are shown in the parentheses. Given the cross-sectional nature of the data and the wide variation of countries in the sample, heteroskedasticity and scale effect posed a potential problem in the estimation of the equations. In order to deal with this problem, the estimations were done using the White Heteroskedasticity-Consistent Standard Errors & Covariance[11].

3.3.1 GDP and Distance

The estimation results revealed large demand and supply effects on trade in both exporting and importing countries, as shown by the large coefficients of GDP. For both automobiles and autoparts, the coefficients were all positive and statistically significant at the 1% level.

The distance variable revealed important findings. The estimation results for both automobiles and autoparts showed negative coefficients, which were statistically significant at the 1% level. This shows that distance negatively affects trade flows between countries. The longer the distance between countries, the less will be bilateral trade between them. As the distance variable is used as a proxy for transportation costs, these results reveal that international transportation costs are lower between closer countries than countries that are geographically distant.

An important finding is the decreasing trend in the distance coefficients in both automobile and autoparts estimation results. The decreasing trend shows that distance or transportation costs had a decreasing effect on automobile and autoparts trade. This decreasing trend can be due to a general improvement in transportation systems, the development of more advanced infrastructure and cheaper port operations. Although geographic distance is fixed, the improvement in transportation technologies has led to a shortening in the "functional distance", as measured by the time required to travel between countries. In such a case, the effect of geographic distance on trade would decrease, as captured by the decreasing distance coefficients over time. In addition, since this dummy variable is also used as a proxy for natural barriers to trade and access to information, the decrease in the coefficients can also be associated with technological improvements in telecommunications and the revolution in information technology, which has made information more transparent and accessible, thus improving knowledge of foreign markets.

It is interesting to note that in the case of the autoparts trade, distance coefficients were higher than the distance coefficients for automobile trade. This shows that trade in autoparts is more

sensitive to changes in distance than automobile trade. This can be explained by the widening in the geographic scope of autoparts trade due to companies adopting the "global sourcing" strategy aimed at seeking better price and quality across the world market and trading more with geographically distant countries.

3.3.2 The Regional Integration and Trade Diversion Dummies

Automobiles

The dummies for regional integration and trade diversion showed interesting results and, when observed simultaneously, revealed important findings.

In the case of Mercosur, the regional integration dummies DMerc showed positive signs whereas dummies for trade diversion TDMerc had negative signs in all periods. Although in the first two periods 1988/1990 and 1991/1993 , the t-statistics for regional integration dummies were not significant, the dummies for trade diversion in these two periods were significant at 5% and 1% levels respectively, showing that trade occurred more with member countries. It is interesting to see that the coefficients for the regional integration dummy in the case of Mercosur increased in the third and fourth periods 1994/1996 and 1997/1999 and the t-statistics became significant at the 1% level. The increase in coefficients shows that trade in automobiles increased substantially in these periods and also clearly shows the trade creation effect in automobiles due to the formation of Mercosur. Substantial increases in automobile trade occurred mainly between Argentina and Brazil due to the consolidation of Mercosur as a customs union in 1994. It is also interesting to see that the dummy for trade diversion continued to be negative, but not significant, in the last two periods. In addition, the coefficients decreased compared to previous periods. Although these dummies were not significant, these results show some evidence that Mercosur countries are more opened to trade than in the first two periods analyzed.

In the case of the European Union, regional integration dummies DEU were positive, with the exception of the second period - 1991/1993, when the coefficient was negative but not statistically significant. The positive coefficients were, however, not significant. The effect of regional integration on trade was actually captured by the trade diversion dummies TDEU . These dummies were negative and statistically significant from the second period analyzed, showing that trade is highly concentrated among member countries.

In the case of NAFTA, both dummies captured the effect of regional integration. With exception to the second period 1991/1993 , when the regional integration dummy was negative but not significant, the regional integration dummies DNAFTA were positive and statistically very significant from the third period. The trade diversion dummies TDNAFTA were all negative and significant at the 1% level from the second period. These results showed that trade in automobiles are

larger with member countries than with non-members as indicated by the negative and very significant trade diversion dummies. This can be explained by the increase in trade due to the formation of NAFTA through the transfer or reallocation of American automobile company production to Mexico and Canada. Under the provisions of the NAFTA agreement, trade in automobiles increased substantially among member countries.

It is interesting to see that in the case of Mercosur the coefficients for trade diversion decreased and t-statistics became insignificant from the third period. In EU, coefficients decreased slightly from the period 1994/1996 and t-statistics also showed decreasing statistical significance. This shows some evidence that although trade is concentrated among member countries, there was also an increase in trade with non-member countries, leading consequently to a decrease in trade diversion effects.

Autoparts

In the case of Mercosur, regional integration dummies (DMerc) were all positive and coefficients increased substantially over the four periods analyzed. In addition, these dummies were all significant at 1% level. These results clearly show the trade creation effect of Mercosur on autoparts trade. Due to the increasing intra-regional trade liberalization, autoparts trade increased substantially between Argentina and Brazil. In the case of the trade diversion dummies, it is interesting to observe the change in the sign of the coefficient over the last two periods. In the first two periods, trade diversion dummies were negative but statistically not significant. However, in the last two periods, the coefficients became positive but though not highly significant. The change in coefficient signs gives some indication that apart from trading with partner countries, Mercosur is also importing autoparts from non-member countries, reducing some possible trade diversion effects.

In the case of the EU, with the exception of the period 1991/1993, the coefficients for regional integration dummies (DEU) increased and were positive. It is interesting to see that these coefficients became very significant at 1% level as from 1994, showing the trade creation effect of integration and that trade in autoparts in European countries was more intense among members than with non-member countries. The trade diversion dummies were negative until the third period and statistically significant only in the second period (1991/1993). In the last period (1997/1999), the coefficient became positive but still not significant. These results show some evidence that there was an increase in trade with non-members and trade diversion effects diminished.

In the case of NAFTA, all regional integration dummies (DNAFTA) showed positive coefficients and were statistically very significant. These results clearly show the trade creation effect of NAFTA on autoparts trade. Since the formal constitution of NAFTA in 1994, autoparts trade among member countries increased substantially. In relation to the trade diversion dummies (TDNAFTA), the results were similar to Mercosur. Although not statistically significant, the coefficients until the second period (1991/1993) were negative, showing that there was no trade diversion. However, from the

third period 1994/1996 , the coefficients became positive and t-statistics showed a slight increase, although still not so significant. These results show some evidence that there was also an increase in autoparts trade with non-members.

IV. Concluding Remarks

The analyses conducted in this paper revealed that automobile trade is more concentrated among countries of the same integration scheme. In relation to Mercosur, the effect of regional integration was captured in the second half of the 1990s by the regional integration dummy, showing that there was substantial increase in automobile trade among member countries, especially between Argentina and Brazil. As a result, Mercosur became an important region in the global strategies of multinational corporations. In European Union, the regional integration effect was captured mainly by the trade diversion dummies and in NAFTA, both dummies captured the effect of regional integration on automobile trade. The results confirm the hypothesis that automobile companies increasingly adopted regional strategies in order to achieve economies of scale, reduce costs and rationalize production, by strategically locating plants within integrated markets.

The analysis of regional integration and trade diversion dummies also clearly showed the various impact of regional integration on autoparts trade. As observed, trade in autoparts was highly concentrated among member countries and the coefficients of regional integration dummies increased substantially in Mercosur, European Union and NAFTA countries in the second half of the 1990s. This fact is associated with the "follow sourcing" strategy adopted by the autoparts companies in the world. In order to support and maintain proximity to the automobile assembling companies, autoparts companies have increasingly followed the automobile companies. In addition, autoparts companies also adopted strategies considering the integrated and expanded regional markets. Another interesting finding was that for all regional integration schemes in this analysis, the trade diversion coefficient became positive in the second part of the 1990s although not all significant . This shows some evidence that although trade was highly concentrated among member countries, there was also an increase in autoparts trade with other non-member countries, leading to a reduction in trade diversion effects. This can be related to the increasing "global sourcing" strategies adopted by the automobile multinational companies as mentioned before.

Another important finding in this analysis was the effect of the distance variable on automobile and autoparts trade. The decreasing coefficient of distance provided evidence that transportation costs decreased in the 1990s and this can be associated with improvements in transportation systems leading to greater efficiency, cost reduction and shortening of the functional distance. In addition, the decrease in this coefficient can also be related to advances in information technology and telecommunications making the flow of information more transparent and market information more readily available. This finding is very important in showing that investments in transport

The Impact of Regional Integration Schemes on the Automobile and Autoparts Trade

infrastructure and information technology are important elements in trade performance.

　The analysis conducted in this paper clearly showed that regional integration schemes play an important role in the internationalization of automobile and autoparts companies and in the formulation of their competitive strategies. In addition, the analysis is of great importance in guiding policy makers on future negotiations concerning trade agreements and in guiding automobile and autoparts companies on their investment decisions.

Notes:

1　Examples of these mergers and acquisitions are between Daimler and Chrysler which later also included the Japanese company Mitsubishi ; Ford's acquisition of Volvo; and the partial acquisition of the Japanese company Nissan by the French company Renault.

2　See UNCTAD 2000 , "Cross-border Mergers and Acquisitions and Development, World Investment Report 2000", United Nations.

3　The data for FDI inward stock for Central and Eastern European countries was not available for the year 1988. In 1999, these countries were grouped separately from the developing countries' group.

4　In tables 2 and 3 these contries are included as "Other Asian" countries.

5　For examples, see Aitken 1973 , Thursby and Thursby 1987 , Bergstrand 1985 , Brada and Mendez 1983 .

6　They found positive and statistically significant coefficients for all integration schemes, with the exception of EFTA and NAFTA.

7　In this study, with the exception of NAFTA, all the other integration schemes showed positive and statistically significant coefficients. In relation to Mercosur, the coefficients were positive, but not significant in the first two periods analyzed. In the other two periods, the coefficients become significant.

8　Although the present model is a static one that tries to capture the effects of trade creation and trade diversion on automobile and autoparts trade, due to the characteristics of these sectors nowadays, the model assumes that the trade flows also reflect or incorporate the movement of capital between countries. This reservation must be borne in mind.

9　Although Paraguay is a member of Mercosur, it was not included in the model because its automobile and autoparts industries are very small.

10　However, it is worth noting that both Mercosur and NAFTA started negotiations and established trade agreements before the official formation of the regional integration scheme.

11　Experiments were also made by normalizing the equation with the sum of GDPi and GDPj. However, this led to very high correlation among some of the normalized explanatory variables. Then, this method was abandoned.

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