Horizontal and vertical intra-industry trade of Nafta and Mercosur: The case of the automobile industry

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"Horizontal and Vertical Intra-Industry Trade of NAFTA and MERCOSUR: The case of the Automobile Industry"

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Abstract

The NAFTA and MERCOSUR agreements seem to have accelerated the regional integration process respectively within North and South of America. In the South in particular, MERCOSUR has led to trade liberalisation and deregulation, which has resulted in significant growth of its regional trade. In this article, we study the pattern of that trade growth in the automobile industry. Our results highlight an increase of intra-industry trade in the corresponding industry since the beginning of the 1990s. To obtain the calculation of the importance of intra-industry, we use the Grubel and Lloyd indicator (1975). Then to follow the method set out by Abd-el-Rahman (1991), Greenaway et al. (1995), Fontagné and Freudenberg (1997), we distinguish horizontally differentiated goods from vertically differentiated goods using a comparison of the unit values. Subsequently, with the increase of intra-industry trade, it appears that MERCOSUR has favoured in particular the development of trade in vertically differentiated goods. In NAFTA, intra-industry trade exists in most sectors and in two bilateral relations (United States – Canada and United States – Mexico). In MERCOSUR, the automobile industry has experienced the highest rate of growth in intra-industry trade, which accounts for 66% of total trade and 90% of all intra-regional trade. Consequently, we analyse the nature of that increase and more precisely, the determinants of intra-industry trade. In order to explain the pattern of trade for the automobile industry, we present an econometric model integrating principles of gravity, which takes into account some country-specific variables.

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INTRODUCTION

The NAFTA and MERCOSUR agreements seem to have accelerated the regional integration process respectively for the North and South of America. In the South in particular, MERCOSUR led to a trade liberalisation and deregulation, which resulted in a significant growth of its regional trade. As a result, trade volumes inside MERCOSUR were multiplied by five between 1990 and 1998. Together with the acceleration of growth in the United States, NAFTA boosted Mexican exports to the US by more than 20 per cent a year in the 1990s. Today the US represents almost four fifth of Mexican imports and exports. Symmetrically, Mexico has also increased its share in US' international trade and is currently the third largest trading partner after Canada and Japan. Therefore, the regional process seems to have induced an intensification of trade between member countries. In this context, it is interesting to analyse the nature of trade in which NAFTA and MERCOSUR countries are engaged. As a matter of fact, most of the literature explaining trade of similar goods refers to the European Union. We would like here to concentrate instead on NAFTA and MERCOSUR and analyse the determinants of intra-industry trade in the automobile industry.

Given its crucial importance in the growth of manufacturing bilateral trade, the motor vehicles and autoparts industry has become a significant case to be studied. The expansion of intra-industry trade in this industry is due to firms' new strategies aiming to meet both national and regional policy targets. In a regional integration process, the reduction of trade barriers between member countries has also intensified the intra-industry trade. Regional integration has permitted to benefit from the exploitation of economies of scale in a significant group of industrial activities. Within this group of manufactures, following our results, products made by the motor vehicles and autopart industries, especially for MERCOSUR, are those accounting for the largest volume and registering the highest rates of intra-industry trade within intra-regional.

Moreover, our first results demonstrate the importance of intra-industry trade, mostly in NAFTA compared to MERCOSUR for all sectors of the automobile industry. This result seems to be compatible with the criteria of economic distance and the level of development, even if MERCOSUR intra-industry trade grew a lot in the 1990s. Subsequently, with the increase of intra-industry trade, it appears that MERCOSUR has favoured the development especially of trade in vertically differentiated goods. In NAFTA, intra-industry trade exists in most sectors and in two bilateral relations (United States – Canada and United States – Mexico). In MERCOSUR, the automobile industry has experienced the highest growth rate in intra-industry trade, which accounts for 66% of total trade and 90% of all intra-regional trade. In this context, this study aims to be an application to the automobile industry because firstly

the regional intra-industry trade rose significantly in this sector and, secondly because of its specific features. Actually, this sector plays a key role in GDP as it represents 12% of the industrial Mexican GDP. Moreover, the liberalisation process guided the intra-zone trade before the creation of NAFTA and MERCOSUR with the "IDPP" (International Division of Production Process) which has a regional logic. In a first part, we will determine the share of trade types by making a distinction between vertical and horizontal intra-industry trade. Subsequently, the second part presents the influence of the main country-specific variables to explain the evolution and the structure of intra-industry.

1. Automotive regime

The negotiations relating to the automobile trade with the Canada-US Auto Pact constituted a first step toward regional integration that has lead to NAFTA. The Auto Pact signed in January 1965 created a sectoral free trade agreement. In this context, about 95 percent of Canada-United States' trade in automotive products are duty free. To be qualified as a Pact member some conditions must be respected. As a matter of fact, producers notably have to maintain a minimum of 60 percent Canadian value added in their passenger vehicles' production. Canada implemented this agreement multilaterally so that vehicles and parts could enter duty free from any country in the world as long as the conditions of the agreement were met. In contrast, the United States implemented the agreement bilaterally so that only parts and vehicles from Canada are qualified for duty-free entry. The Canada-US Free Trade Agreement in 1989 cemented this process while Mexico was isolated from the corresponding negotiations. As a matter of fact, until the late 1980's, Mexico used Auto Decrees, foreign investment regulations, and tariffs to keep the industries segmented along the Rio Grande.

NAFTA provided for the elimination of Mexican tariffs, local content requirements, trade balancing requirements, and limited market share, generally within a ten-year period on vehicles from the U.S and Canada. Mexican tariffs on cars and light trucks originating from the US or Canada that meet the NAFTA rule of origin were reduced from 20 to 10 percent on January 1, 1994. The passenger car tariff is subsequently reduced by 1.2 percent in 1995 and by 1.1 percent per year and expected to be reduced to 0 on January 1, 2003. For light trucks, the tariff is reduced by 2.5 percent per year beginning 1995 in order to attain zero on January 1, 2003. The NAFTA rule of origin is a regional content requirement that establishes the minimum criteria that products must meet in order to benefit from preferential tariff treatment between the US, Canada and Mexico. From 1994 to 1997, at least 50 percent of a light vehicle's net cost must be of value originating in North America. From 1998 to 2001, this value has increased to 56 percent, and is expected to reach 62.5 percent in 2002. All others

vehicles had to meet 50 percent between 1994 and 1997, 55 percent between 1998 and 2001, and 60 percent thereafter. Rules of origin seek to assign origin to the country domiciling the last significant economic activity.

MERCOSUR that was created in 1991, established a common market which would include the free movements of goods, services and factors of production, the elimination of customs duties and non-tariff restrictions and the establishment of a common external tariff. Whereas a quick process of trade liberalisation based on relatively low tariffs was recently adopted in Argentina and Brazil, the automotive industry was excluded and regulated by a regime based on import quotas and export targets. At the same time, the automotive regime was linked to a compensated trade scheme within MERCOSUR. Since the beginning of 1990's, local production of vehicles in Argentina and Brazil is protected from competitive imports through quotas. Moreover established automakers could import vehicles at a far more reduced tariff than the general tariff for imports within the quota. MERCOSUR permitted for countries to export various goods without customs tariffs and a nationalisation rate of 50 % instead of the 60 % established by the block. The creation of the MERCOSUR has strengthened the determination of some multinationals to remain in Argentina and Brazil and has attracted new companies that expect to benefit from the prospects provided by the expanded market. The most important change in industrial strategy by firms is the adoption of greater internationalisation patterns. Given the size and growth of the market and the production infrastructure and experience available in Argentina and Brazil, it is understandable that multinationals are interested in increasing their productive involvement. Furthermore, MERCOSUR has been conceived as an open regional integration scheme aiming at fostering intra-industry trade. The policy framework was certainly influenced by the predominant presence of affiliates of transnational corporations in the production structure of this branch. It is obvious that the main factors that influence firms' strategies are the compensation agreements within NAFTA and MERCOSUR and the local content requirements for finished vehicles. The local content requirements have encouraged the terminal automakers to be directly involved in the domestic production of autoparts and to develop suppliers. Given the importance of multinational in NAFTA and MERCOSUR automobile industry, strategies of firms have certainly a significant incidence on the pattern of trade.

2. Theoretical Review of intra-industry trade.

For three decades, the theory of intra-industry trade has been presenting a specific interest. As a matter of fact, simultaneous exports and imports of similar goods represent a large and increasing share of trade. Hence, trade structure cannot be predicted solely by the traditional

theory of trade. As a matter of fact, Ricardian and Hecksher-Ohlin type models explain the nature of trade by supply side differences. Following these models, one would expect that trade only appears between countries characterised by different factor endowments. Nevertheless, world trade is essentially dominated by trade between developed countries with similar economic structures and factors endowments.

In models of monopolistic competition, the preference for variety on the demand side combined with the presence of economies of scale on the production side play a crucial role in the increase of intra-industry trade. Consumers have a preference for the variety. However, only a small number of them is domestically produced. This happens because of the presence of increasing returns to scale, which favours the concentration of production by limiting the optimal number of varieties that may be produced in each country. Lancaster (1980) and Krugman (1979, 1980) show that intra-industry trade expansion is a result of product differentiation in markets with monopolistic competition and increasing returns to scale. According to these authors, trade in differentiated products is most likely to take place between countries with similar factor endowments and which have a high level of per inhabitant income. Helpman and Krugman (1985) synthesize traditional and new international trade theories in a framework that incorporate together differences in factor endowments, decreasing costs and horizontal product differentiation, in order to explain both intra- and inter-industry trade. To illustrate that, they take a standard model assuming two countries, the North (relatively capital-abundant) and the South (relatively labour-abundant), two production factors, labour and capital, and two goods. Fixed supplies of labour and capital are mobile within industries but immobile between countries. Production functions are identical in the two countries. The first product is differentiated and the other one homogeneous. The former is produced using relatively capital-intensive techniques; the latter is produced using relatively labour-intensive technology. Therefore, they show that the South country will export the homogeneous good while both countries will produce and export differentiated products. Furthermore, consumers are supposed to have a preference for goods variety represented by Spence-Dixit-Stiglitz preferences (Spence (1976), Dixit Stiglitz (1977)). Moreover, they assume insignificant transport costs, no trade impediments, and levelling factor prices. The volume of intra-industry trade evolves when allocation of resources changes between trading partners. Following the traditional Stolper Samuelson effect, inter-industry trade induces a high level of adjustment costs. In contrast, for the intra-industry trade, human capital is mobile across firms and in this case, adjustment costs are assumed to be much smaller than for inter-industry trade.

Under the assumptions above and assuming the trade balance, Greenaway, Hine and Milner (1994) consider in a first step, that production factors are reallocated proportionally between the North and the South. The resources reallocation induce changes on the relative size of the countries, the North's size decreases (s) whereas the South's size rises. The economic divergence between the North and the South emphasises themselves. So, in a second step, the volume of intra-industry trade diminishes. On the contrary, if countries become similar, the intra-industry trade would be increased. The production of manufactured good (M*) in the South will increase with a larger capital stock and according to the second equation, intra-industry trade increases. Similarly, intra-industry trade decreases if the relative amount of capital (labour) decreases in the South (North). Therefore, intra-industry trade increases with lower differences in the market size and in capital-labour ratios.

Abd-el-Rahman (1991) and Greenaway and al. (1995) propose to distinguish horizontal and vertical intra-industry trade because determinants of each type differ. Vertical intra-industry responds mainly to factor endowments, whereas horizontal intra-industry notably depends on economies of scales and monopolistic competition. Horizontal intra-industry trade arises when produced goods are similar in quality, but different in their variety features. The theoretical source for such trade has been developed by Lancaster (1980) and Krugman (1981, 1980)., and Bergstrand (1990). These models suggest that similar countries in terms of income intensity do horizontal intra-industry trade. We can put forward the following hypothesis where horizontal intra-industry trade is associated with a high degree of products differentiation and scale economies. Falvey (1981), Falvey and Kierzkowski (1985) and Shaked and Sutton (1984) explain vertical intra-industry trade as simultaneous export and import of products, which are different by their quality. Falvey (1981) considers two countries having different endowments of capital and labour in order to explain this type of trade. As a result, the higher is the income of a country, the higher abundant is its capital, the more it specialises in high quality manufactures. In contrast, the lower income country, relatively labour-abundant specialises in low-quality manufactures. Additionally, Falvey and Kierzkowski (1985) demonstrated that the share of vertical intra-industry trade increases in an environment where many big firms settle and produce numerous varieties. Falvey's model has an explicit supply side. They suggest that the share of vertical IIT will be positively correlated with the differences of the average market size, and the growing difference in per capita income. As a matter of fact, the greater the differences in labour-capital endowment of the two countries and, the greater the difference in per capita income develop the vertical IIT.

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Regional integration will have a different impact according to the nature of trade. In the trade of similar products horizontally differentiated, the traditional Stolper-Samuelson effect considers that the adjustment cost will be compensated by gains in variety for the factor that is scarce. The incidences of intra-industry trade vertically differentiated and of inter-industry trade are mixed. In both cases, the adjustment process is expected to be costly for the scarce factor and could increase the disparities of revenues within countries.

3. Measurement of intra-industry trade

The most widely used indicators to measure the extent of intra-industry trade was put forward by Grubel & Lloyd. We use it in order to calculate the part of balanced trade (overlap between exports and imports) in all trade in a given industry k between the country i and j.

$$GL_{ij,k} = 1 - \frac{\left| X_{ij,k} - M_{ij,k} \right|}{X_{ij,k} + M_{ij,k}}$$

where $X_{ij,k}$ and $M_{ij,k}$ represent respectively in the industry k, exports and imports between countries i and j.

The main bias of this indicator is that when there is a trade imbalance, the flow cannot be in totality considered as intra-industry In order to correct this bias, Grubel and Lloyd, Aquino proposed some adjustments. Moreover, the traditional GL measure highlights the intensity of overlap in trade without distinguishing the pattern of trade. Nevertheless, most economists continue to use the unadjusted Grubel and Lloyd indicator. By construction, this indicator displays the trade imbalance as part of inter-industry trade flows and trade overlap representing intra-industry trade. So, two distinct theoretical concepts are used to explain a same flow. As a matter of fact, if we assume that the majority flow (here exports) is 60 and the corresponding minority flow (here imports) is 40, so the overlap of 80 is considered to be intra-industry trade, the remaining 20 being inter-industry flows. In this case, the majority flow is both inter- and intra-industry trade. Its inter-industry part (20) is explained by the traditional theory based on comparative advantages and differences of factor endowment in a perfect competition context. In contrast, the intra-industry part (40) is explained by the new theories of international economics, which are relevant to imperfect competition and increasing returns to scale. The authors demonstrate that in this environment, intra-industry trade is developed between countries of similar economic structures.

Hence, in order to improve our analysis, we adopt the methodology based on Abd-EL-Rahman (1986) and further refined in Fontagné & Freudenberg (1997). Fontagné and Freudenberg consider a different concept of intra-industry trade. They propose a method,

which distinguishes a flow as either relevant to one-way or two-way trade. In order to apprehend the phenomenon in intra-industry trade, the first step of our analysis is to determine the level of overlap. Trade in an item is considered to be two-way when the value of the minority flow represents at least 10% of the majority flow:

$$\frac{Min(X_{ij,kt}, M_{ij,kt})}{Max(X_{ij,kt}, M_{ij,kt})} > 10\%$$

where X and M represent exports and imports, indices i referring the declaring country, j the partner country and k the product in year t.

When we determine a flow as being two-way trade, the exchanges of products will be defined as horizontally or vertically differentiated. Following the previous authors, we assume that differences in prices (unit values) reflect quality differences. Therefore, products with close unit value are considered to be similar. Trade products are considered to be similar if export and import unit values differ by less than 15%, when this is not the case, products are considered to be vertically differentiated, following this condition:

$$\frac{1}{1.15} \leq \frac{UV_{ij,kt}^{X}}{UV_{ij,kt}^{M}} \leq 1.15$$

where UV represent export (X) and import (M) unit values between i referring the declaring country and j referring the partner country for the product K in year t.
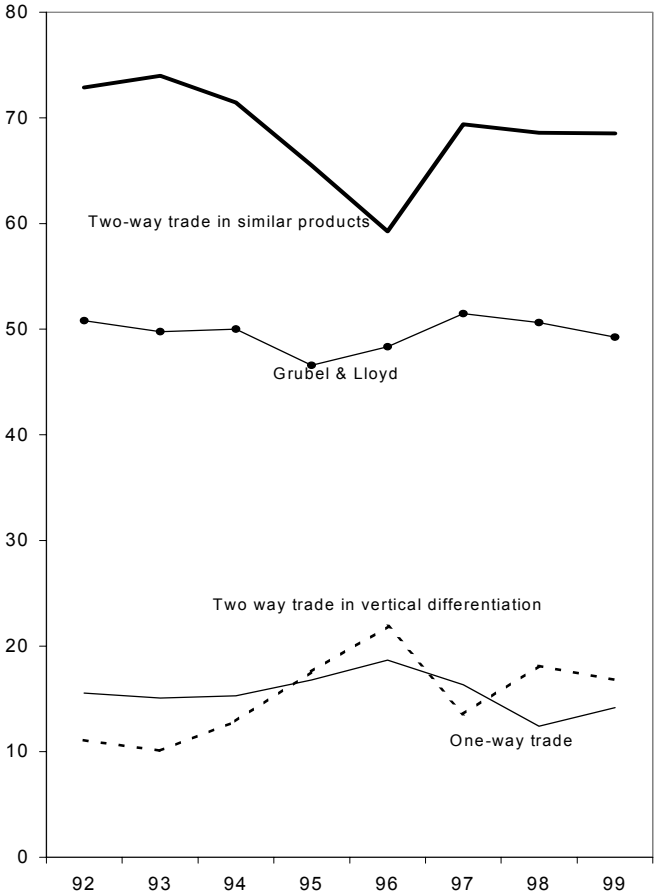
4. Empirical investigations of NAFTA and MERCOSUR

To compute the degree of intra-industry trade, in a first step, we use the Grubel and Lloyd indicator (1975). In a second step, following the method from Abd-el-Rahman (1991), Greenaway and al. (1995), Fontagné and Freudenberg (1997), we distinguish the goods horizontally differentiated from those vertically differentiated. We compute these indicators by using data on imports at the 6-digit from the Harmonised System. We analyse the intra and inter-industry trade at the 6-digit level of the HS nomenclature inside the automobile industry. Hence, the concept of intra-industry trade is defined more at a level product than industry level. These data were extracted from Comtrade over the period 1997-1999; from OCDE for the members of NAFTA and from DataIntal for MERCOSUR countries. The data cover the period 1992 to 1999 and concern nature of trade within NAFTA and MERCOSUR, and also with their main partners. We analyse the pattern of intra-product trade inside NAFTA and MERCOSUR over the last 7 years at the most aggregated level of the automobile industry.

Figure 1 plots the traditional Grubel and Lloyd (GL) indicator and the share of the three trade types in intra-NAFTA from 1992 to 1999. First, we can notice that the share of intra-product

trade in NAFTA is particularly great. Nevertheless, during the period, the level is actually rather stable. The GL was around 50% in the early 90s, and has remained stable during all the period. The most important trade type in the beginning of the 1990s was the two-way trade in similar products, representing about 70% of the total trade. However, from 1994, it began to decrease in favour of vertical intra-product trade. As a matter of fact, at the beginning of the period, the vertical intra-product trade represented around 11%, and raised progressively in order to reach 18% in 1999.

Figure 1. Evolution of trade types and the GL indicator in intra-NAFTA trade, 1992-1999
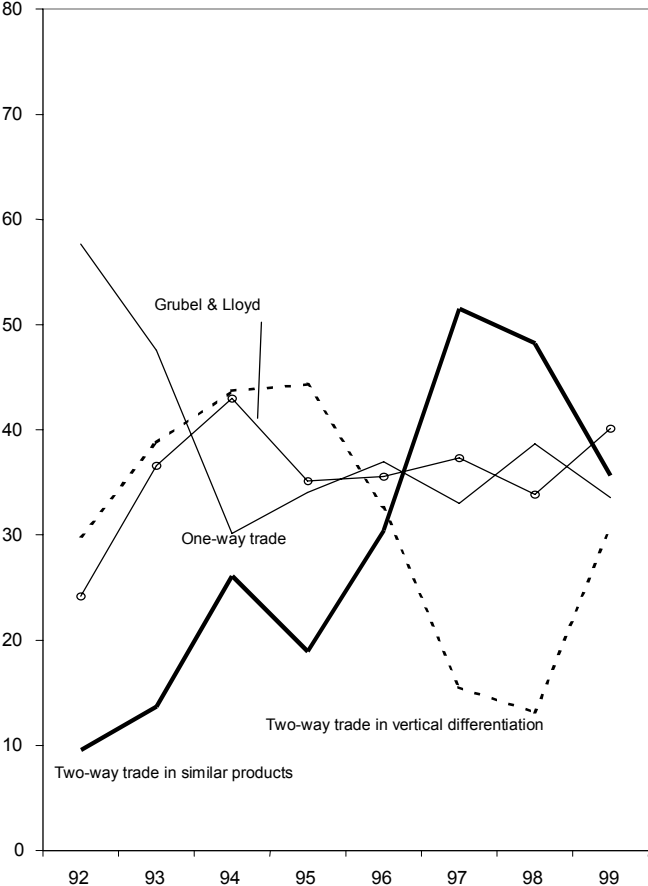

Source: OECD, COMTRADE and DataIntal.

In contrast with NAFTA, even if intra-product trade in MERCOSUR (figure2) increased, the one-way-trade has remained significant with a share superior to 30%. The differences between the two blocks can be explained by the economic development disparities. While NAFTA represents a rich regional block MERCOSUR encloses emerging countries, which, even if they knew a prosperity period, are still more specialized than rich ones. The period from 1992 to 1994 was characterised by a great increase of the two-way trade and a fall of the one-way trade. The evolution of two-way trade in vertical differentiation was symmetric to two-way trade evolution in similar products from 1992 to 1999. Nevertheless, since 1996 the

growth of intra-product trade benefited mostly to trade of similar products. The two-way trade in similar products, which represented around 11% at the beginning of 1990s reached 36% at the end of 1990s.

Figure 2. Evolution of trade types and the GL indicator in intra-MERCOSUR trade, 1992-1999
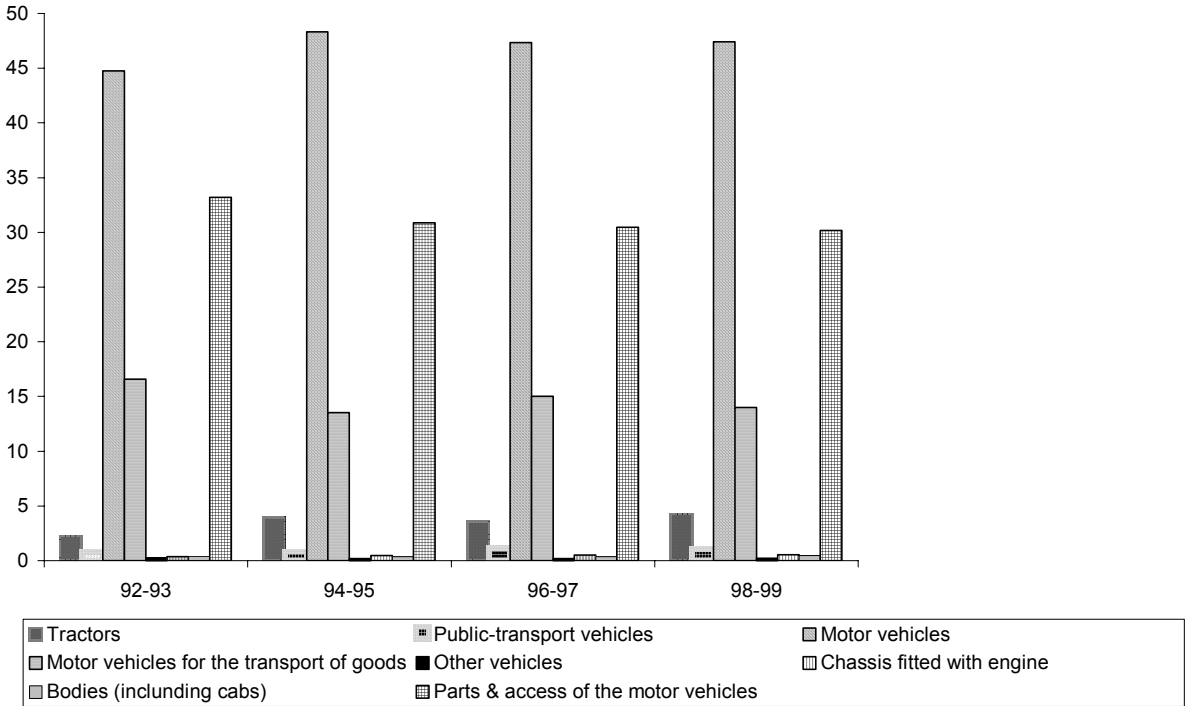
The eight sectors used in this study embody the main sectors of trade in the automobile industry inside NAFTA and MERCOSUR. Figure 3 and 4 present shares of each sector in the intra-NAFTA and the intra-MERCOSUR for the automobile industry. In NAFTA and MERCOSUR, intra-regional exchanges in the automobile industry mainly concerned three sectors- Motors Vehicles, Motors Vehicles for Transport of Goods and Parts and Access-which concentrate around 80% of the total trade.

Figure 3 reveals that for NAFTA, the "motor vehicles" represent the most important sector over the considered time period, with a share of about 47%, followed by "parts and access of the motor vehicles" -with a share of about 30%- and the "motor vehicles for the transport of goods" -with a share around 15%. The share of these sectors in the total trade of automobile industry inside the NAFTA remains quite stable. Figure 4 shows that for the considered period, "motor vehicles" sector accounts for the biggest share in total trade inside

MERCOSUR concentrating around 40% of trade, followed by motors vehicles for the transport of goods and parts and access representing respectively 28% and 20%.

Figure 3. Share of sectors in intra-NAFTA trade, 1992-1999

The relative importance of these sectors changed between 1992 and 1999. The share of "part and access" highly raised in the second period -with a share of 34%; consequently, it decreased to reach at the last period 20%.

Figure 4. Share of sectors in intra-MERCOSUR trade, 1992-1999

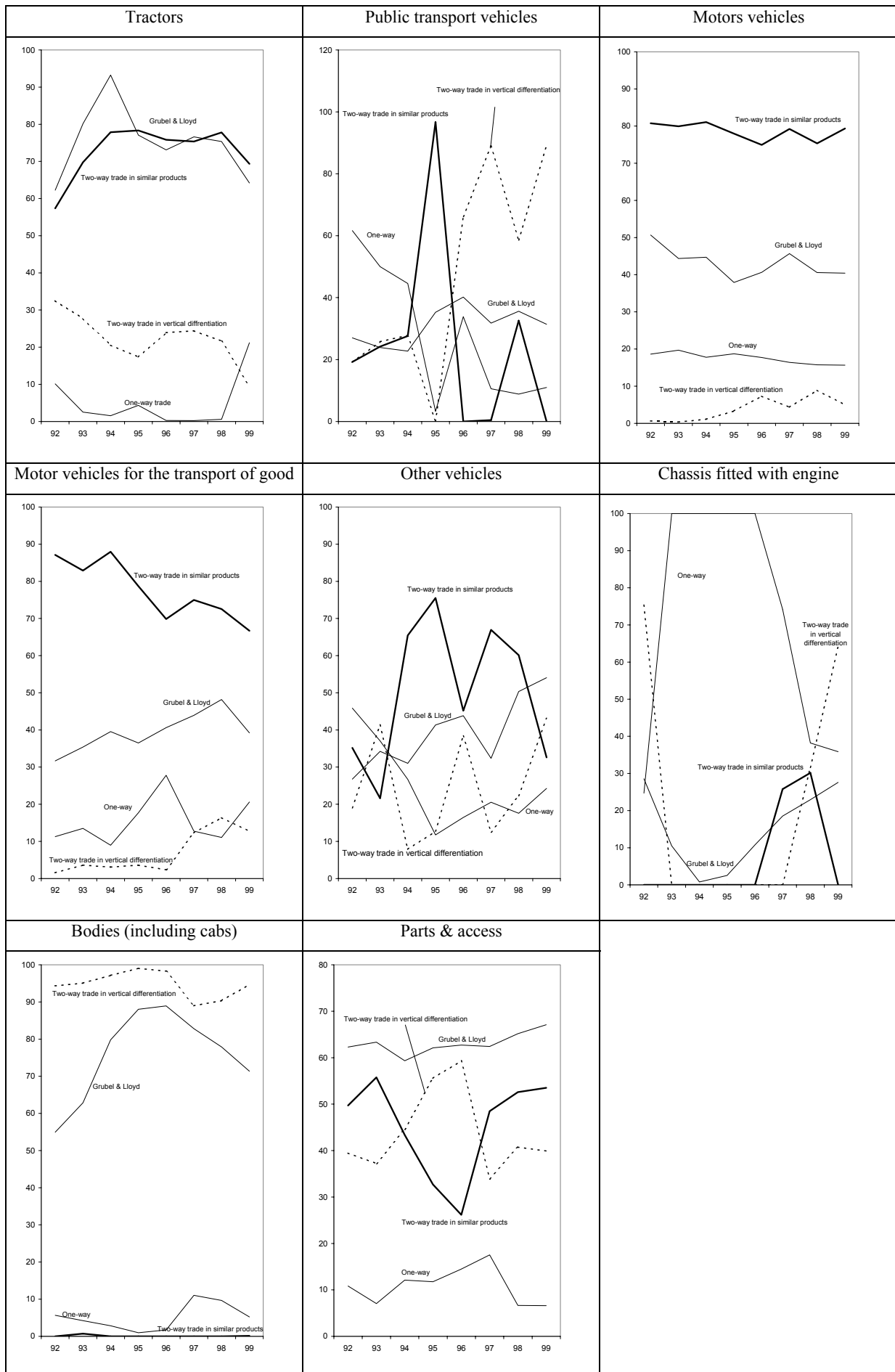## 5. Results at a desegregated level for NAFTA and MERCOSUR

Figure 5 and 6 point out to the evolution of the traditional GL and the share of trade types by sectors between member countries of NAFTA and MERCOSUR. The study of the evolution of the traditional GL index shows the high importance of intra-product trade for NAFTA (figure 5). We can distinguish two groups:

(a) The first group gathers sectors, which are characterised by an important share of intra-product trade. "Tractors", "bodies" and "parts and access" figures provide a high level of the GL, clearly superior to 60 % for all the considered periods. However, "motors vehicles for the transport of goods", "motors vehicles", "other vehicles" display a share of intra-product trade around 40 %. Concerning the "parts and access" and "motors vehicles for the transport of goods" sectors, we notice an increase during the considered period.

(b) The second group is characterised by a lower degree of intra-product trade, which is still significant. In the public transport vehicles about one third of total exchanges are intra-product trade. After an important drop, "Chassis fitted with engine" knew a significant growth of the GL index since 1994. As a matter of fact, this indicator was around 18 % at the beginning of 1990s to reach 26 % during the last period considered.

After having presented the evolution of the traditional GL indicator, we will analyse now the three trade types in order to differentiate the pattern of intra-product trade. We can distinguish two groups of sectors on the basis of their intra-NAFTA trade types between 1992 and 1999:

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(a) the first group is characterised by a high share of two-way trade in similar products. "Motor vehicles", "motor vehicles for the transport of goods" and "tractors" sectors represent more than 70% of horizontal intra-product trade during the period considered. The trade of these products seems essentially determined by the preference for the variety and the similar and precise needs of the consumers. A relative stability can be found in the evolution of sectors characterised by an important share of two-way trade in similar products. Nevertheless, concerning "motor vehicles for the transport of goods" sector, we can identify the growth of the two-way trade in vertical differentiation at the expense of the two-way trade in similar products. As a matter of fact, the share of vertically differentiated products grew from around 2% in 1996 to 17% in 1998.

(b) in contrast, "parts and access of the motor vehicles", "bodies" and "chassis fitted with engine" are characterised by an important share of two-way trade in vertically differentiated products. For "bodies", the share of vertical intra-product trade is particularly high with a stable level around 80%. The "parts and access of the motor vehicles" sector experimented a rapid growth of two-way trade in similar products since 1997. Nevertheless, trade of vertically differentiated goods remained significant and important with a rate around 40 % for the considered period.

Figure 5. Evolution of the share of trade types and the GL indicator in intra-NAFTA trade by sectors, 1992-1999
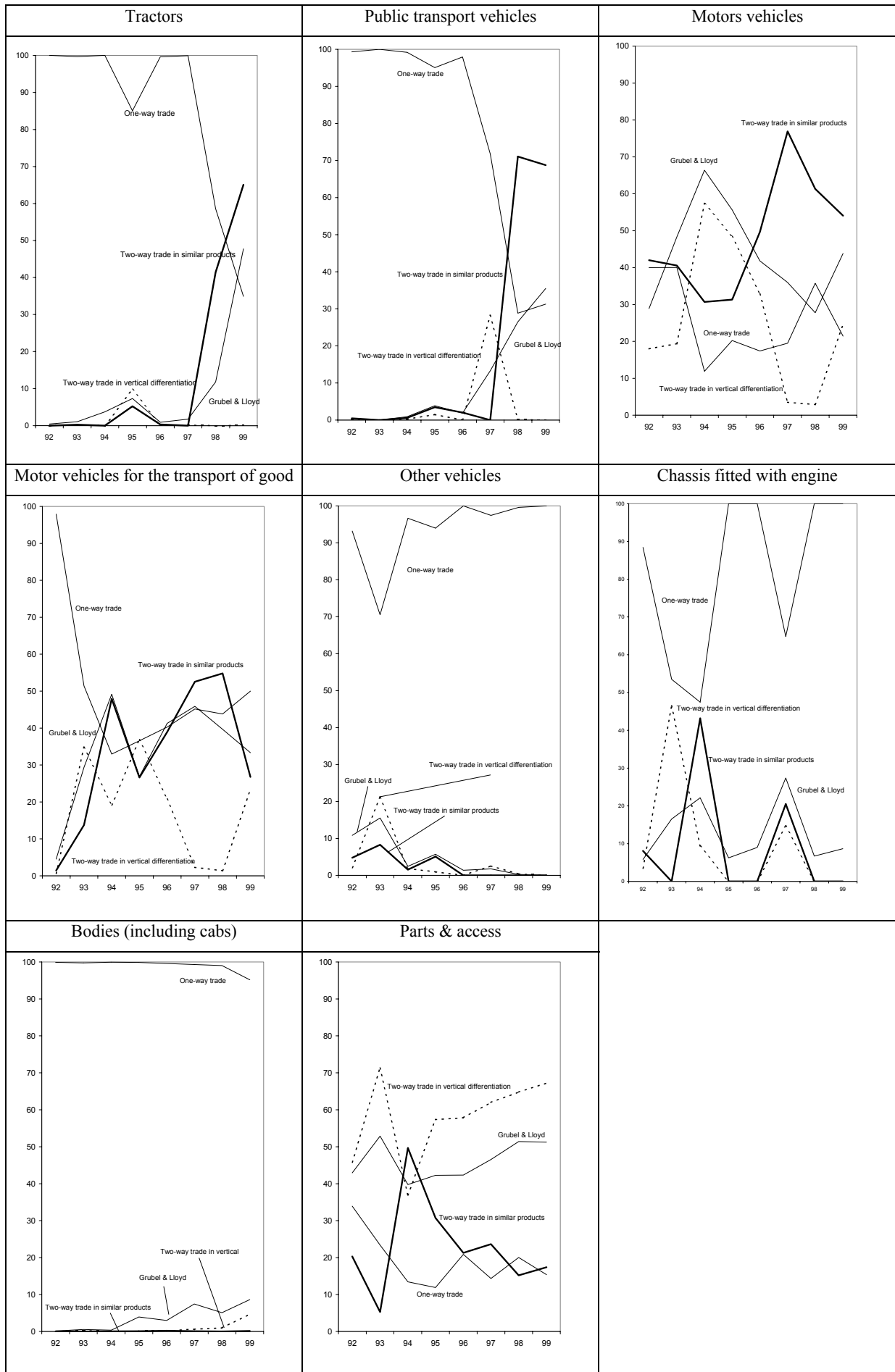
According to figure 6, for countries which belong to MERCOSUR, the evolution of GL indicator is quite different and we can distinguish three tendencies:

a) sectors in the first group are characterised by an important share of intra-product trade. "Motors vehicles" and "motors vehicles for the transport of goods" with a share higher than 30%, and "parts and access of the motor vehicles" sector which presents the highest level of intra-product trade. Indeed, more than 40% of trade in this sector is intra-product trade. Nevertheless, as for the first two sectors, traditional GL index experiences a discontinuous evolution. As for NAFTA, we can equally mention that these three sectors concentrate more than 80% of exchanges of automobile industry.

b) the second group gathers countries which knew an important growth of intra-product trade during the period. As a matter of fact, the share of intra-product trade of "tractors" and "public transport vehicles" sectors respectively increased from 1% and 0% to 48% and 34% between 1992 and 1999.

c) for "other vehicles", "chassis fitted with engine" and "bodies" sectors, for the last period, inter-product trade represents most of total trade with a GL indicator inferior to 10%.

The first results demonstrate that the essence of trade in automobile industry is mainly intra-product trade.

Figure 6. Evolution of the share of trade types and the GL indicator in intra-Mercosur trade by sectors, 1992-1999

Inside MERCOSUR, the pattern of trade can also be studied in order to disentangle the components of intra-product trade. Three groups can be distinguished:

(a) The first one is characterised by sectors that favour the one-way trade. "Other vehicles", "chassis fitted with engine", and "bodies" sectors have experimented the highest rate of one-way trade with a share around 50% or more. The logic of this trade seems coherent with the traditional trade theory, which highlights the specialisation of the countries following comparative advantages. However as we saw previously, these sectors represent a negligible share of trade (around 1%).

(b) industries characterised by a high share of two-way trade in similar products are "motor vehicles", "public transport vehicles", and "motors vehicles for the transport of goods " since 1994. The evolution of intra-product trade of the second sector is particularly surprising. As a matter of fact, until the mid 1990s, trade in this sector had been characterised by an important share of one-way trade which faced on a rapid and important decrease in favour of horizontal intra-product trade. Thus, during 1998-1999, 60% of trade for public transport vehicles sector had been horizontally differentiated. "Motor vehicles for the transport of goods" sector had been characterised by a high raise since the beginning of 1990s. In this context, we identify an asymmetric evolution between inter-product trade and intra-product trade. And since 1994, we notice a symmetric evolution between trade of horizontally and vertically differentiated products.

(c) The last group is characterised by an important share of two-way trade in vertical differentiated products. Concerning "parts and access" since 1994, the share of two-way trade in similar products had decreased in favour of two-way trade in vertical differentiation (with since 1997 a share of vertical IIT superior to 60%). It notably corresponds to the division of labour and the relationship between headquarters and subsidiaries based on a specialisation along ranges of qualities.

In MERCOSUR, the level of inter-product trade for the automobile industry is higher than that of NAFTA. Nevertheless, we can notice that in two-way trade, MERCOSUR favoured especially the development of trade in vertically differentiated products at the end of 1990s. This evolution was expected and seemed to correspond to the economic structures of member countries. As a matter of fact, MERCOSUR represent a regional block integrating countries with disparities standard of living and different level of development. In this context, specialisation and trade of these economies are based on comparative advantages.

6.Type of trade of NAFTA and MERCOSUR with their main partners

Table 1 and 2 present the different kinds of trade by partner country for NAFTA and MERCOSUR for the last period.

Table 1. Share of trade types and GL indicator between NAFTA and their main partners

Countries	Share in 1998-1999 (%)			
	Two-way trade in vertically diff. products	Two-way trade in similar products	One-way trade	Grubel and Lloyd
Canada	**26,2**	**68,8**	3,7	**52,5**
France	37,8	1,0	60,1	31,9
Germany	15,4	0,0	84,6	21,9
Italy	27,9	1,2	70,8	24,2
Korea	15,9	0,0	84,1	10,2
Mexico	**37,3**	18,1	**41,7**	**36,9**
Spain	39,9	0,0	59,7	19,8
Sweden	7,9	0,0	91,9	5,3
Taiwan	6,5	0,0	93,4	9,7
United Kingdom	34,2	0,7	64,8	32,8
United States	**31,1**	**56,2**	11,3	**51,1**

Source : OCDE and DataIntal

We observe a very interesting result for NAFTA, which reveals that intra-product trade is higher between members of NAFTA than with other partners. Otherwise, Canada and the United States favour horizontal intra-product trade. As a matter of fact, trade in similar goods differentiated by their attribute represents more than 55% of total trade. In contrast, intra-product trade between Mexico and NAFTA is constituted by an important share of two-way trade in vertical differentiated products. Exterior countries of regional block essentially develop trade based on one-way trade with a share superior to 60 %. Thus, we can assume that intra-product trade develops between member countries of regional block and that external countries favour inter-industry trade with NAFTA. It seems that for this industry, free trade agreement accompanied with the geographic proximity may have a decisive incidence on the pattern of trade.

In contrast to NAFTA, intra-product trade between MERCOSUR countries is not high in comparison to non-member countries. As we mentioned previously, most of the exchanges of the automobile industry between MERCOSUR and its main trade partners concern one-way-trade. Nevertheless, inside the regional block, Argentina and Brazil favoured the intra-product trade, especially the vertical differentiation with most partners. In the same way, two-way trade in vertically differentiated products for Mexico, the United States and Uruguay represents respectively 57%, 42% and 58% of total trade. We can assume that this phenomenon, this pattern of trade corresponds to the differences in economic level between MERCOSUR and their partners. Both leader members countries of the customs union,

Argentina and Brazil develop a trade of similar nature. Their trade with MERCOSUR is respectively constituted for Argentina and Brazil by 36% and 32% in vertically differentiated products, by 32% and 30% in horizontally differentiated products and, 32% and 38% in inter-product.

Table 2. Share of trade types and GL indicator between MERCOSUR and their main partners

Countries	Share in 1998-1999 (%)			
	Two-way trade in vertically diff. products	Two-way trade in similar products	One-way trade	Grubel and Lloyd
Argentina	**36,0**	**32,4**	31,7	**39,1**
Bolivia	0,0	0,0	100,0	0,0
Brazil	**32,1**	**29,6**	38,2	**36,9**
Canada	2,2	0,0	97,8	4,8
Chile	0,8	0,1	99,1	3,4
France	9,7	3,6	86,7	9,1
Germany	14,2	0,0	85,8	14,1
Italy	18,3	14,3	67,4	19,2
Korea	0,1	0,0	99,9	0,1
Mexico	**57,3**	0,0	**42,7**	**29,5**
Taiwan	1,1	0,0	98,9	0,8
Paraguay	0,1	0,0	99,9	2,9
Spain	12,8	0,5	86,7	6,7
Sweden	7,3	1,8	90,8	11,6
United Kingdom	21,9	4,5	73,6	13,5
United States	**42,4**	0,1	**57,5**	**34,6**
Uruguay	**57,6**	0,7	**41,7**	**38,3**

Source : OCDE and DataIntal

7. Variables and model

The analysis of trade nature distinguishes horizontal differentiation, which corresponds to the variety preferences of consumers, and vertical differentiation, which refers to trade in quality products. The explanatory variables are the following :

Market size

$GDP_{ij,kt}$ is an indicator of the size of the economies. The explanatory variable is measured on a bilateral basis using the average GDP (in current US\$) of the declaring country i and his partner j, following the methodology put forward by Bergstrand (1990). For Bergstrand (1990), an increase of market size, raises the labour-capital ratio, thus intensifying the division of labour between trade partners. The main hypotheses state that the bilateral volume of intra-industry trade is positively related to the averages of country size (proxied by GDP). As a matter of fact, a large market size increases the potential to produce great varieties.

Difference in market size

The variable DGDP represent the difference in size between the countries. The bigger is the difference of economic size, the lower is the intra-industry trade. The correlation between economic distance and the share of vertical IIT is positive because products vertically differentiated come from different production functions. The logic of comparative advantages applies to vertical IIT as to one-way trade. In accordance with Balassa (1986), Balassa and Bauwens (1987) and Somma (1994), the following ratio is used:

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

$$\text{where } w = \frac{GDP_i}{GDP_i + GDP_j}$$

Standard of living

Income per capita PCI_{ij} expressed as a bilateral average is positively associated with the intra-industry trade and notably horizontal intra-industry trade. Income per capita represents a proxy of level of the capital-labour ratio. In Helpman and Krugman (1985), the differentiated good is assumed to be capital-intensive in production. As a matter of fact, one can assume that a country characterised by high income specialises in relative capital-intensive production because they benefit from a higher capital-labour ratio in supply side. Otherwise, following Bergstrand's model (1990), we assume that higher levels of per capita income and GDP suggest a higher level of economic development. The average per capita income can be intepreted as an indicator of demand structure. In this context, demand for variety is assumed to increase with the income's level.

Economic distance

The economic distance is represented by the difference between PCI_i and PCI_j as indicated by Fontagné and Freudenberg (1997). We assume that a lower difference in per capita income leads to intra-industry trade. Per capita income may influenced the pattern of trade through both demand and supply side. Following Linder (1961), per capita income represents an indicator of demand structure, a greater equality in per capita income implies that demand structure become more similar in the two trading countries. In this way, the potential for intra-industry trade increases. Moreover, if we consider that differences in per capita income reflect the disparity in capital-labour endowment this variable should then be positively associated with the vertical differentiation of products and negatively with the horizontal differentiation of products.

Geographic Distance

Krugman (1980) argues that intra-industry trade decreases with the rise of transport costs. For this article, we use the kilometres distance between capitals of MERCOSUR and NAFTA members with their main partners.

Border

Grubel and Lloyd suggest that the share of border intensify the intra-industry trade. This surmise results from the fact that transport and transaction costs may be particularly high for some products. In this context, the share of border decreases the transport costs and facilitates the intensification of trade and notably the two-way trade.

Regional integration

Subsequently to the regional integration process, decreasing tariff barriers between member countries seem to have intensified intra-industry trade, facilitating a growing production specialisation and a better use of scale economies. Trade liberalisation, by expanding market, will lead both to a rising variety of products. As the automobile industry takes advantage from scale economies and a high potential of goods differentiating, we can assume a revealing increase of intra-industry trade. It seems particularly interesting to analyse the development of intra-industry trade in order to determinate break and continuity periods of the process. NAFTA and MERCOSUR intensified the trade between partners. This rapid growth of trade may have induced a change in its nature.

Exchange rate

In theory, there is no relationship between the exchange rates and the nature of trade. In principle, following Bergstrand (1990), the exchange rate, EXR_{ij} might have an incidence on the volume of trade. Nevertheless, it appears that countries, notably members of MERCOSUR was confronted at large variations in exchange rate during considered period. As a matter of fact, after having analysed the evolution of the nature of trade, we notice between two periods, extreme fluctuations. In this context, we can assume that variations of exchange rates can affect the results.

Tableau 3. Explanatory variable

| Variables | Intra-Industry Trade | |
	Horizontal Differentiation	Vertical Differentiation
Market size (GDP) Average of GDP in current dollars	+	+
Difference in market size (DGDP) Normalised differences in GDP	-	+/-
Standard of living (PCI) Average income per capita	+	+
Economic distance (PCID) Difference in PCI	-	+
Geographic distance (Dist) Distance between capital	-	-
Share of border (DBORDER) Dummy (1 when share of border, else 0)	+	+
Regional integration (DMERCOSUR) Dummy (1 when agreement, else 0)	+	+
Regional integration process (DNAFTA) Dummy (1 when agreement, else 0)	+	+
Exchange rate (EXR) Bilateral of exchange rate	+/-	+/-

After having presented the explanatory variables we can present the model. The estimation of the model was made with Ordinary Least Square. The dependant variables are both the share and the value of the three trade types in bilateral NAFTA and MERCOSUR with their partners by sectors of automobile industry from 1992-1993 period to 1998-1999. Following the literature on the determinants of intra-industry trade (IIT), we estimate a regression model of the following form, which distinguishes vertical and horizontal IIT. The model integrates gravity variables and variables of Bergstrand's model. These models are used to explain the nature of trade.

$$IIT_{IJ} = \alpha_{i0} + \sum_m \alpha_{im} Z_{ijm} + U_{ij}$$

We try to determine the explanatory variables on values and share intra-industry trade distinguishing Grubel and Lloyd ratio, vertical and horizontal intra-industry trade, and one-way trade. Following each type of trade, the horizontal intra-industry trade index IIT_{hj} (i=h) between a country (i) and its trading partner country (j) depends on a set of country characteristic variables Z_{hjm}, which are the conventional countries factors influencing intra-industry trade and which are presented above.

8. Results of the Regression

The results of the estimation for one-way-trade, horizontal and vertical intra-product trade illustrated in value and share are reported in tables 4 and 5.

Table 4: Panel data: results for values of bilateral trade types in NAFTA and MERCOSUR (1992-1999)

	Intra-Product Trade						Inter-Product Trade		
	Horizontal Differentiation			Vertical Differentiation			One-way trade		
	parameter	Stand err	sign. level	Parameter	stand err	sign. level	parameter	stand err	sign. level
GDP	1.2420	0.1332	0.0001	2.7868	0.1369	0.0001	1.6327	0.0645	0.0001
GDPD	-2.2582	0.4070	0.0001	-7.2000	0.4185	0.0001	-2.0988	0.1972	0.0001
PCI	1.2904	0.2855	0.0001	0.9720	0.2936	0.0010	0.7700	0.1383	0.0001
PCID	-0.9239	0.1707	0.0001	-0.5783	0.1755	0.0010	-0.5472	0.0827	0.0001
Dist	-1.1359	0.1332	0.0001	-2.8431	0.2651	0.0001	0.1297	0.1249	0.2993
EXR	0.0075	0.0369	0.8390	0.0702	0.0379	0.0645	0.0022	0.0178	0.9009
DMERCOSUR	-1.3938	0.6108	0.0228	-1.1635	0.6280	0.0643	0.7782	0.2959	0.0087
DNAFTA	6.5069	0.9385	0.0001	1.5838	0.9650	0.1011	1.7501	0.4547	0.0001
DBORDER	2.9856	0.6264	0.0001	1.1811	0.6441	0.0671	2.2526	0.3035	0.0001
N	826			826			826		
adj R2	0.4113			0.6326			0.6664		
F value	65.114			159.040			184.353		
Prob>F	0.0001			0.0001			0.0001		

One-way-trade

The sign associated with PCID is rather surprising. This variable is supposed to be a proxy for the economic distance and should be associated with a positive sign. As a matter of fact, economical distance representing a proxy of advantages comparatives, so, we expected to an intensification of the inter-product trade at the detriment of the intra-product trade. This result would signify that trade for the automobile industry with members of NAFTA and MERCOSUR, shouldn't depend on comparative advantages. In contrast GDPD and PCI is associated with a negative parameter as expected and confirms the theory. In order to estimate the incidence of regional integration, we incorporate in the equation dummies DNAFTA and DMERCOSUR illustrating the membership of the countries to a preferential agreement. These dummies have a positive and significant impact on the values of one-way trade.

Vertical intra-industry trade

Turning to two-way trade in vertical differentiation for values and shares, the signs are conventional except for the economic distance (PCID), we obtain following results:

The size of countries approximated by GDP and the standard of living represented by PCI have a positive and significant (especially for GDP explanatory) incidence on intra-product trade in vertically differentiated products. As a matter of fact, on the one hand, a large market increases opportunities to produce different qualities; on the other hand, a large income raises the demand for differentiation. One should keep in mind that GDP variable represent a proxy of factor endowment following Bergstrand (1990).

The differences PCI should have a positive impact on this type of trade. Nevertheless, the results explain the value of trade based on vertically differentiated products and we can

assume as Fontagné and Freudenberg (1997), that gravity principles influence the results. However, NAFTA seems to have a positive impact on the evolution of trade of commodities differentiated by their quality, although MERCOSUR appears to have a negative impact. Geographic distance has the negative sign as expected. We obtain an interesting result for this type of trade where fluctuations of exchange rate seem intensify the exchanges of products different in their quality. Moreover, this variable is only significative for the vertical intra-product trade. In this context, it seems that exchanges of vertically differentiated products are more sensitive at the prices than horizontally differentiated products.

Table 5: Panel data: results for shares of bilateral trade types in NAFTA and MERCOSUR (1992-1999)

	Intra-Product Trade						Inter-Product Trade		
	Horizontal Differentiation			Vertical Differentiation					
	Parameter	Stand err	Sign. level	parameter	stand err	sign. level	parameter	stand err	sign. level
GDP	0.5231	0.0686	0.0001	1.3628	0.0929	0.0001	-0.0939	0.0120	0.0001
GDPD	-1.0132	0.2080	0.0001	-4.3083	0.2817	0.0001	0.1840	0.0365	0.0001
PCI	0.3710	0.1433	0.0098	0.2333	0.1910	0.2296	0.0044	0.0251	0.8608
PCID	-0.3022	0.0879	0.0006	-0.0010	0.1191	0.9931	0.0140	0.0154	0.3643
Gdist	-0.8805	0.1135	0.0001	-1.9341	0.1537	0.0001	0.3084	0.0199	0.0001
DMERCOSUR	-0.3254	0.3093	0.2930	-0.5099	0.4188	0.2237	0.2382	0.0543	0.0001
NAFTA	2.8132	0.4801	0.0001	-1.1133	0.6501	0.0872	-0.5415	0.0843	0.0001
EXR	0.0081	0.0166	0.6255	0.0520	0.0225	0.0212	-0.0063	0.0029	0.0308
N	826			826			826		
Adj R2	0.2624			0.504			0.6053		
F value	42.983			120.914			181.952		
Prob>F	0.0001			0.0001			0.0001		

Horizontal intra-industry trade

Considering the value and share of horizontal intra-product trade, all variables have the expected sign. Trade based on exchanges of products horizontally differentiated increases with the size of countries and income. These two variables reflect the increase of demand and supply variety. Moreover, differences in size of countries hinder intra-product trade in similar products since the potential for gains in variety is reduced. After a regional integration process, the expected convergence of member countries of NAFTA should lead to a rise in this pattern of trade. Besides the dummy NAFTA has a high and significant impact on trade of similar products distinguishing by their varieties. The geographic distance representing a proxy of transport costs has a negative incidence on this nature of trade. As a matter of fact, products characterised by high quality are less dependent on transaction, transport and distribution costs. Even if we can improve the estimate of the regional integration, it seems that MERCOSUR doesn't have a positive incidence on trade of similar products. The geographic proximity, the similarity in economic development and the narrowness of the relationship between countries of MERCOSUR before the signature of the treaty may explain the automobile industry structure.

In order to test the reliability of our results, we introduce fixed effects by country. Obtained results confirm the robustness of our model and the effetcs of explanatories variables.

Table 6 Panel data : results for values of bilateral trade types in NAFTA and MERCOSUR (1992-1999)

	Intra-Industry Trade						Inter-Industry Trade		
	Horizontal Differentiation			Vertical Differentiation			One-way Trade		
	parameter	Stand err	sign.level	parameter	Stand err	sign.level	parameter	Stand err	sign.level
GDP	1.09157	0.17754	0.0001	2.39486	0.18471	0.0001	1.81512	0.08679	0.0001
GDPD	-3.04346	0.5387	0.0001	-6.63168	0.56044	0.0001	-1.89582	0.26334	0.0001
PCI	1.35789	0.29905	0.0001	1.00366	0.31112	0.0013	0.61505	0.14619	0.0001
PCID	-0.80614	0.16854	0.0001	-0.47781	0.17534	0.0066	-0.48965	0.08239	0.0001
Dist	-1.63269	0.23093	0.0001	-2.91325	0.24025	0.0001	-0.45242	0.11289	0.0001
EXR	-0.00052	0.0001	0.0041	-0.00018	0.00018	0.3421	-0.00033	0.00008	0.0002
DMERCOSUR	-1.03843	0.59515	0.0814	-1.08736	0.61916	0.0794	0.74043	0.29094	0.0111
DNAFTA	7.00708	0.91615	0.0001	2.12005	0.95312	0.0264	2.22374	0.44785	0.0001
DBORDER	1.96399	0.68987	0.0045	1.01082	0.71771	0.1594	0.941	0.33724	0.0054
N	826			826			826		
adj R2	0.4438			0.6447			0.6792		
F value	39.77			89.16			103.87		
Prob>F	0.0001			0.0001			0.0001		

CONCLUSION

Our first results demonstrate the importance of intra-product trade, mostly in NAFTA compared to MERCOSUR. NAFTA favours exchanges in products differentiated horizontally although MERCOSUR develops more vertical intra-product trade. The main results of the regression highlight the great importance of the country-specific variables, especially following the theory, the criteria of economic distance and standard of living, play a key role. The regional integration seems to have an impact on the nature of trade and particularly for NAFTA. Nevertheless, estimation of the free trade agreement is not robust. We propose for posterior studies to improve this measure incorporating variables such as tariff and non-tariff barriers . We plan to integrate as well industry-specific variables as differentiation of products and market structure, which are very important for explain the vertical intra-product trade.

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