MERCOSUR as an export platform for the automotive industry

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The global automotive industry is dominated by a few multinational corporations which design global and regional strategies. If regional strategies prevailed over global ones, the Southern Common Market (MERCOSUR) could become a competitive export platform. This paper reviews the extent to which trade agreements covering the automotive industry in MERCOSUR have helped the region develop into a platform for exports to the rest of the world. Bilateral trade data from 1991-2005 and gravity models are used to evaluate trade creation and export market diversification in the automotive industry. The results show that, as of 2005, MERCOSUR agreements had not turned the region into a platform for exports to external markets, although they had contributed to trade creation within the region.

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I

Introduction

Automotive production is dominated by a handful of multinational corporations. In 2005, the leading five (General Motors, DaimlerChrysler, Toyota, Ford and Volkswagen) accounted for 65% of total output. Subsidiaries of some of these firms began producing in Argentina and Brazil in the 1950s, motivated mainly by the growth in these countries' domestic markets. These markets were highly protected, as the automotive markets of producing countries generally are.

However, new trends in the industry in the 1990s weakened the role of domestic markets and the incentives for multinationals to continue expanding the production capacity of their subsidiaries. The trend now was to increase international competitiveness by internationalizing production, a strategy that was seen as effective both in cutting costs and at the same time in increasing product variety worldwide. In this context, protectionist policies ceased to be the best incentive for creating an internationally competitive automotive industry, as corporate strategies contained strong global elements that perpetuated the need for extensive international trade in both vehicles and parts within the corporation and with suppliers abroad.

The widespread adoption of global strategies by multinationals in the automotive sector ought to have created a "global car", a car produced globally for global markets. The evidence seems to show, however, that automakers tend to make most of their sales in the regions where their headquarters are based and that they locate their subsidiaries strategically to capture markets in the vicinity of their production sites. These regional strategies are implemented simultaneously with global strategies, and may be said to complement them.

Section II examines these global and regional strategies in greater detail, confirming the findings of many authors (Freyssenet and Lung, 2000; Humphrey and Memedovic, 2003; Rugman and Collinson, 2004) to the effect that regional strategies in the automotive industry are more efficient and profitable than national or global ones. This offers encouraging prospects for

MERCOSUR, as it could potentially be a production and export platform for an internationally competitive industry.

Integration between the MERCOSUR members (Argentina, Brazil, Paraguay and Uruguay) has not yet been fully achieved for the automotive industry. Instead there are a number of bilateral agreements between partners. The most important are those between Argentina and Brazil, which between them account for almost 100% of automotive production in MERCOSUR. These countries signed a special trade agreement for the automotive sector in late 1994. The integration process intensified yet further in consequence of a second agreement signed in 2000. The purpose of the present paper is to ascertain the extent to which the 1994 and 2000 agreements led to genuine trade creation and whether they have facilitated export market diversification.

This paper seeks to answer the following research questions. Is there evidence of trade creation after 1994 and since 2000? Are there patterns of export market diversification after those years? Are these patterns similar for Argentina and Brazil? Is diversification occurring at the expense of trade within the bloc?[1]

The methodological approach is based on the concept of revealed competitiveness. The paper will analyse the extent to which the intensity of "intra-bloc" trade, the diversification of exports to "extra-bloc" markets, or both, increased in these countries in the years following their agreements. A number of databases were merged to estimate sectoral gravity models and an unbalanced panel of 59,165 worldwide bilateral automotive industry trade flows (ISIC Rev. 2, No. 341) was prepared for the period from 1991 to 2005.

Section II, as noted, analyses global and regional trends in the industry; section III contextualizes the study by describing the main features of the regulatory framework and also presents the main production and trade statistics for the automotive industry in Argentina and Brazil; section IV presents the research questions and hypotheses. Section V describes the methodology used to test the hypotheses, section VI examines the empirical findings and section VII, lastly, presents the conclusions.

[1] The term "bloc" as used in this article refers to the partnership between the two countries.

II

International trends in the automotive industry[2]

From 1961 to 2005, global car output rose by 337%, giving a cumulative annual growth rate of 3%. This process of expansion was accompanied by ever-increasing concentration in the global automotive market which, as already mentioned, is now dominated by a few large multinational corporations.

Despite the concentration of the market, the share of global output accounted for by the United States has been diminishing. The country produced 44% of all vehicles in 1961, but by 2005 the figure had dropped to 18%. Meanwhile, the global share of other regions such as Asia (and China in particular) increased greatly. This relocation of production could be explained by the emergence and intensification of global and regional corporate strategies.

The 1990s saw the appearance of global trends in the industry driven essentially by the goal of enhancing competitiveness by cutting costs and increasing product variety. These trends, which led to a reorganization of the value chain and the internationalization of production, are known as "commonalization", "modularization" and "global sourcing".[3]

"Commonalization" consists in the use of common platforms and other mechanical components globally to concentrate most design activities in few locations.[4] It creates new possibilities for increasing scale (especially in design and development) and for economies of scope, since with few alterations different models and versions can be produced on the same platforms. Design activities are usually located in core countries and developing countries thus tend to adopt a "follow design" strategy, meaning that they are rarely involved in the design of their own models, instead adopting models designed centrally by the parent corporation.[5] Nonetheless, firms' regional strategies do create some windows of opportunity

for design activities by developing-country subsidiaries, especially when promoted by regional policies (see Ciravegna, 2003, for the case of Fiat-Brazil).

"Modularization" entails a shift in automotive production architecture away from assembly of parts towards assembly of subsystems. The production of subsystems may be outsourced and certain special suppliers (sometimes called mega-suppliers) may produce an individual module for a complete subsystem (instrument panels, seats, gearboxes, doors, etc.). Consequently, modularization also entails greater responsibilities for mega-suppliers, and automakers have increasingly established symbiotic relationships with these as a result. For example, it is now common to see suppliers and automakers participating in joint engineering activities as they cooperate to generate new products, processes or both. This ever-closer dependence on suppliers has led automakers to forge long-term relationships with a smaller number of them, as opposed to encouraging competition between a great many potential suppliers, which was the strategy applied in earlier decades. Again, as suppliers play a greater role in production activities, the automakers themselves are specializing more and more in design.

"Communalization" and "modularization" have to some extent driven the third trend: "global sourcing". Because common components are used to produce different models and suppliers are becoming key players in automotive production, the automakers usually prefer to buy from the same suppliers, irrespective of where production is carried out. This means that suppliers, especially mega-suppliers and other first-tier suppliers (but not second- and third-tier producers of basic components), need to globalize.[6] Likewise, just-in-time technologies sometimes require global suppliers to follow automakers to wherever they are producing, a strategy

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[2] This section is largely based on Arza and López (2008a).

[3] See Humphrey, Lecler and Salerno (2000) for further details on these global strategies.

[4] The concept of the platform includes the chassis, suspension, transmission and engine compartment, among other elements (Bastos Tigre and others, 1999).

[5] This marks a clear shift away from the technical and production logic of the 1960s and 1970s, when the different models were produced and sold in national and regional markets with major adaptive innovations introduced by various subsidiaries around the world (Cimoli and Katz, 2001).

[6] The term "tier" is used for different groups of vehicle part manufacturers ranked by the sophistication of their output and the type of relationship they establish with automakers. In the first tier are makers of parts incorporating engineering and design processes and often developed on a modular basis. In the second tier are component makers that also supply the first tier. In the third tier, lastly, are makers of standardized components that are inputs for the automotive industry but also for other industries.

known in the trade as "follow sourcing". This strategy is limited, however, when large economies of scale are required to achieve efficient production.

Broadly speaking, these global trends ought to lead automakers to produce globally in order to sell worldwide. Nonetheless, the empirical evidence seems to show that (i) multinationals concentrate production in the region where their headquarters are located and (ii) multinationals' subsidiaries tend to locate strategically to supply regional markets in the vicinity of their production facilities.

Figure 1 groups the production activities of multinationals into four regions: Asia, Europe, North America and others. As can be seen, none of them is a true global firm if that is defined as a firm carrying out at least 20% of its production in each of the three main production regions: Asia is still the most important production platform for Toyota (64%) and Europe is the region where PSA Peugeot Citroën (83%), Renault (83%), Volkswagen (VW) (71%) and Fiat (65%) do most

of their manufacturing. General Motors (GM) (56%), DaimlerChrysler (54%) and Ford (49%) produce mainly in North America.[7]

This evidence, which highlights the importance of the regional as opposed to the purely global level, is in accord with a debate being conducted in the specialist literature. A number of studies have argued that regional strategies predominate over global ones in global firms. Regional strategies are said to be more profitable, mainly because they are better at exploiting economies of scale and scope simultaneously (Rugman and Hodgetts, 2001).

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[7] This evidence is supported by the findings of Rugman and Collinson (2004), who analysed 2001 data for the entire automotive complex. These authors found that none of the 29 automotive companies (including automakers themselves and parts manufacturers) that were among the world's 500 largest could be called a "global firm", i.e., a firm that had at least 20% of its market in each of the regions making up the triad (North America, Asia and Europe).

FIGURE 1

Internationalization of automotive production, by firm, 2005
(Shares of total output by region)
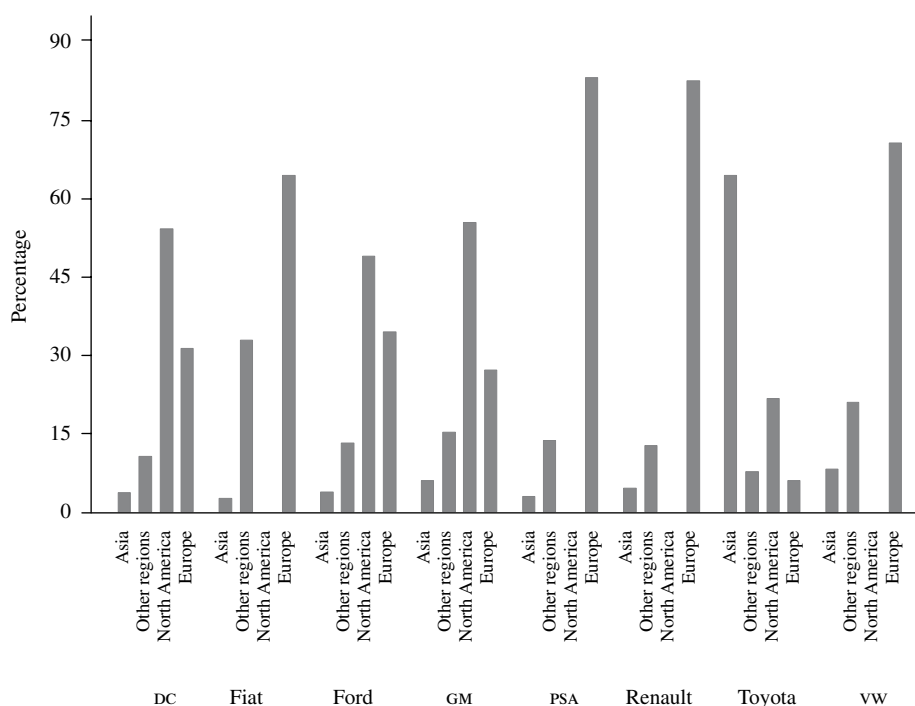
Source: prepared by the author from the database of the International Organization of Motor Vehicle Manufacturers.

Rugman and Collinson (2004) put forward a number of arguments in support of the position that the automotive industry is more likely to try to locate production in regional markets than to turn into a true global industry. In the first place, efficient scale is usually achieved at the regional level (Schlie and Yip, 2000), and this is especially true now that regional trade agreements have become more widespread and comprehensive (Humphrey and Memedovic, 2003). In the second place, demand is often stratified by region because of common cultural and environmental patterns and similar safety regulations and fuel use, among other things. Automakers also prefer their partners in the value chain to operate in the same region they produce in.[8] This is because a well-established network of distribution, financial services and after-market services in the region increases automakers' profitability.

To what extent are these changes in the global automotive industry affecting production in developing countries?

A fundamental point is that, by contrast with the situation in the past, protectionist policies in individual countries will no longer be a pull factor for investment in this sector per se and could even have a negative effect. This is because, as indicated earlier, the current logic of production in the sector has major global and regional components, implying a need for a seamless trade in cars and parts between subsidiaries of the main multinational corporations located around the world and between these and their international suppliers. However, the prevalence of regional strategies at the corporate level does create windows of opportunity for a trade policy based on regional agreements.

Several of these agreements have spread around the globe. MERCOSUR is an interesting case because, other than the Association of South-East Asian Nations (ASEAN), it is the only grouping to contain exclusively developing countries. Although a full agreement among MERCOSUR countries (Argentina, Brazil, Paraguay and Uruguay) has not yet been achieved for the automotive industry, a point that is analysed below, this paper will seek to measure the effect of the agreement on its main partners (Argentina and Brazil) as regards trade creation and export market diversification.

The following section describes changes in the regulations pertaining to trade agreements for the automobile sector between these countries since the 1990s and also discusses the evolution of production and trade in the Argentine and Brazilian automotive industries in the same period.

[8] This suggests that there is a limit to global sourcing.

III

The automotive industry in Argentina and Brazil

MERCOSUR is a major area for the global production and sales of the automotive industry. In 2006, this common market of countries produced 3 million vehicles and ranked seventh internationally among vehicle-producing countries, behind Japan (11.5 million), the United States (11.3 million), China (7.2 million), Germany (5.8 million), the Republic of Korea (3.8 million) and France (3.2 million). After the MERCOSUR countries came Spain (2.8 million vehicles), Canada (2.6 million) and Mexico, India and the ASEAN countries (2 million apiece).[9] In 2006,

2.4 million new vehicles were registered in MERCOSUR, placing the region eighth in the international ranking. Latin America also has a long history of production in this industry, beginning in the late 1950s. In many cases, subsidiaries in MERCOSUR were pioneers in the internationalization strategies of the major firms.

This section will first analyse the evolution of the specific rules governing the integration of the automotive industry in MERCOSUR, from 1994 until 2006. It will provide descriptive statistics to illustrate trade patterns in the industry (chiefly regional trade integration and export market diversification) in Argentina and Brazil during the same period.

[9] Statistics from the International Organization of Motor Vehicle Manufacturers.

1. MERCOSUR integration for the automotive industry[10]

Where the automotive industry is concerned, the integration of the MERCOSUR countries is not yet complete. The member countries have not reached agreement on the common external tariff, intra-bloc trade rules or rules of origin. No common regime has yet been agreed. Instead, there is a long series of bilateral agreements. Brazil and Argentina signed the first agreement in December 1994 and the most recent one in June 2008.

The process of integration between Argentina and Brazil has gone through four stages:

The first stage was one of "no integration". Until 1994, each national regulatory system gave priority to protecting its own domestic market. The two countries' industries competed with each other to win new international markets.

The second stage can be termed "towards integration". This period ran from 1995 to 2000. In late 1994, the two countries signed the Protocol of Ouro Preto, which created the institutional basis for MERCOSUR. With some modifications, the Latin American Integration Association (LAIA) registered this document as the Twenty-eighth Additional Protocol to Economic Complementation Agreement 14. It allowed Argentina and Brazil to carry on applying national rules pending development of a common policy for the automotive sector in MERCOSUR, planned for 2000. The expectation was that the common policy would establish free trade within MERCOSUR, consensus would be reached on the common external tariff and national incentives that distorted regional competition would be abolished. Consequently, while work on a common policy went on, Argentina and Brazil agreed on the following:

(i)   Free trade between them in cars and parts, subject to performance requirements laid down by their respective national regulatory systems (the imports of a partner country had to be offset by exports to any destination).

(ii) Car parts imported from MERCOSUR countries, insofar as they were offset by exports, were considered national for purposes of compliance with the maximum imported content standards.

(iii) Specific rules were agreed on trade quotas (set by firm) for which no compensation was required. The purpose of these quotas was, first, to offset the deficit that arose in Argentina between 1991 and 1994 and,

second, to extend tariff preferences exclusively to automakers located in either country.

The third stage was one of "deepening integration" and ran from 2001 to 2005. The new agreement was signed in 2000 and adopted as the Thirty-first Additional Protocol to Economic Complementation Agreement 14, in force from August that year until 31 December 2005.

This agreement established a common external tariff of 35% for motor vehicle imports from third countries which were not subject to quotas. For automobiles and sport utility vehicles the tariff took effect upon the signing of the agreement, while for other automotive products there was a tariff schedule that converged at 35% as indicated in table 1.

Car parts fell into three groups with different tariff levels, converging on rates of 14%, 16% and 18%, respectively, in 2005 as detailed in table 1. Parts not produced locally could be imported by automakers with a tariff of just 2%.

Where intra-bloc trade was concerned, from January 2001 automotive products were subject to 100% tariff preference provided that they complied with rules of origin (as detailed below) and that the proportion of imports and exports in the industry between partners did not exceed the trade ratios approved for the bloc. As table 1 shows, the coefficients of intra-bloc trade (also known as "flex" and defined as the ratio between imports and exports) tended towards an easing of restrictions on trade within the bloc with a view to achieving free trade by 2006.

To benefit from preferential intra-bloc trade, automakers would have to include regional content of 60%. New models were allowed regional content of 40% the first year and 50% the second, but had to reach the 60% figure from the third year of production. One of the concerns of Argentina was that this agreement might damage its parts and components industry, as the Brazilian real was considerably undervalued against the Argentine peso. Consequently, the Government of Argentina succeeded in introducing a special clause that would be applied to subsidiaries located in the country, setting a ceiling of 50% for parts and components imported from any country until 2003, with this share to rise to 60% in 2004 and 65% in 2005.

Lastly, the agreement did away with government incentives, as all production carried out with the benefit of promotional incentives or support from a government body was treated as extra-bloc production (although this provision did not apply retrospectively).

The fourth stage was one of "reversing integration". By the end of the period covered by the 2000 agreement,

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[10] This section is largely based on Arza and López (2008b).

TABLE 1

Automotive product regulations applying to trade between Argentina and Brazil, 2000-2006

Year	Tariffs for extra-bloc trade[a]					Flex coefficient for intra-bloc[a] trade between Argentina and Brazil approved for a 100% tariff preference
	Trailers and semitrailers, trucks, truck tractors and chassis with engines up to 5 ton load	Buses, car bodies, trucks, truck tractors, chassis with engines up to 5 ton load	Car parts			
			I	II	III	
2000	25.0%	18.0%	7.0%	8.0%	9.0%	b
2001	26.7%	20.8%	8.2%	9.3%	10.5%	1.6
2002	28.4%	23.6%	9.3%	10.7%	12.0%	2.0
2003	30.1%	26.4%	10.9%	12.5%	14.0%	2.2
2004	31.8%	29.2%	12.5%	14.3%	16.0%	2.4
2005	33.6%	32.0%	14.0%	16.0%	18.0%	2.6
2006	35.0%	35.0%	c	c	c	Free trade

Source: prepared by the author on the basis of the Thirty-first Additional Protocol to Economic Complementation Agreement No. 14, Latin American Integration Association (LAIA).

[a] The terms "intra-bloc" and "extra-bloc" within the table refer to the partnership between Argentina and Brazil.

[b] The Additional Protocol mentioned in the source came into effect on 1 August 2000 for tariffs, but the flex came into effect on 1 January 2001. This provision was operative until 31 December 2005. Consequently, there was no flex in 2000 because intra-bloc trade was not regulated for that year.

[c] Although the regulations explicitly stated that there would be no flex in 2006 (intra-bloc free trade) and that other vehicles would become subject to the same tariffs as cars that year (35%), the rules for vehicle parts I, II and III applied only as long as the regulations did (up to the end of 2005). Using these regulations as the information source, therefore, it is not possible to complete columns I, II and III for 2006.

it was clear that the new Argentine Government, in office since 2003, did not regard progress towards a regional free trade regime as desirable. Consequently, a new agreement was signed in June 2006 after lengthy negotiations (the Thirty-fifth Additional Protocol to Economic Complementation Agreement 14) and remained in force until June 2008. This agreement established a number of regulations that largely matched those of the earlier agreement; changes were introduced in intra-bloc trade, however. Instead of bringing about free trade, the agreement signed in June 2006 set a more restrictive flex coefficient of 1.95, as compared to the 2.6 applicable in 2005 (see table 1). A new agreement was signed in 2008 (Thirty-eighth Additional Protocol to Economic Complementation Agreement 14) and is valid until 2014. This confirmed that the flex coefficient of 1.95 would be valid whenever Argentina had a deficit in its automotive trade with Brazil, but that it would rise to 2.5 when the opposite occurred (e.g., intra-bloc trade is more restricted when deficits affect Argentina). Free trade within the bloc is not due to be achieved until July 2013.

This study completes the empirical analysis in 2005, i.e., prior to the start of the "reversing integration" stage.

Lastly, the regional influence of the MERCOSUR automotive industry has been expanding thanks to a variety of preferential trade agreements with other countries in Latin America since the late 1990s: Chile (1996 and 2002), Mexico (2003) and the Bolivarian Republic of Venezuela, Colombia and Ecuador (2005). Argentina and Brazil have also signed a number of agreements with Uruguay since the 1980s; in the context of MERCOSUR integration, however, important steps affecting the automotive sector were taken first in 1994, then in 2002 (Brazil) and 2003 (Argentina).

2. Trade patterns of the Argentine and Brazilian automotive industry

The automotive sector is often considered to be an important pillar of economic and industrial development in Argentina and Brazil. The industry has been systematically supported by governments with opposing views on economic policy. Up to a point, this support has been bound up with issues of political economy (there have been vested interests throughout the long history of production in the sector that make it difficult to remove or reduce government support). Nonetheless, the economic importance of the sector is undeniable. In 2005, the automotive and components industry represented 5.3% of gross industrial production by value in Argentina and 3.5% of industrial employment, while in Brazil the figures were even higher at 10.9% and 6.2%, respectively.

The growth in automotive output in Argentina has been erratic (see figure 2). The industry produced fewer automobiles in 1990 than in 1961. High rates of growth were seen in the 1990s, but in 2002 output dropped back

FIGURE 2

Argentina and Brazil: increase in car production, 1959-2006
(Thousands of units)

Source: prepared by the author on the basis of data from the Motor Vehicle Manufacturers Association (ADEFA) and the National Association of Motor Vehicle Manufacturers (ANFAVEA).

to levels close to those of 1964. This erratic behaviour in Argentina as compared to Brazil explains why Brazilian car output, similar to Argentina's until the mid-1960s, was six times as great in 2006.

The two countries also differ greatly in export performance (see figure 3). Not until 2005 did Argentina's automobile exports catch up with the Brazilian level of the early 1990s (about 180,000 units). Brazilian exports have carried on growing since then, and in 2006 Brazil exported 3.6 times as many cars as Argentina (see figure 3). Argentine exports increased strongly in the 1990s, with a cumulative annual growth rate of 28% between 1992 and 2001, but once again the recession and crisis reversed the industry's export performance in 2002 and 2003. Only in 2004 did exports begin to grow significantly again.

Brazil has also been more successful than Argentina in penetrating extra-bloc markets. As a comparison of figures 4 and 5 reveals, Brazil has managed to diversify its export markets more widely than Argentina. Argentina began exporting outside MERCOSUR in 2002, but mainly to Latin American markets. Brazil, on the other hand, ventured into more demanding markets such as Europe and North America in the early 1990s. Although these markets still account for only a minor share of Brazil's total exports (about 16% in 2005), their economic importance should not be downplayed: the number of cars exported by Brazil to Europe and North America in

2005 was only 35% less than Argentina's total worldwide exports the same year.

Figure 6 shows car exports (ISIC Rev. 2, No. 341) from Argentina and Brazil to markets with and without preferential trade agreements (i.e., exports to MERCOSUR, Chile, Mexico, Colombia, Ecuador and the Bolivarian Republic of Venezuela compared with exports to other markets). This chart reveals the following:

(i)   Intra-bloc trade in MERCOSUR increased substantially in 1995, particularly in the case of Argentina.

(ii) The macroeconomic upheaval of 1998-1999 (recessions in Argentina and Brazil) and 2001-2002 (crisis in Argentina) had a negative impact on intra-bloc trade.[11]

(iii) Mexico and Chile became important markets for Argentina, but even more so for Brazil, around the 2000-2003 period.

(iv) Colombia, Ecuador and the Bolivarian Republic of Venezuela are not major markets for Argentina.

(v)   Other markets without preferential trade agreements have always been very important for Brazilian exports and cautiously began to take exports from Argentina in 2004-2005.

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[11] Intra-bloc trade is actually very elastic relative to gross domestic product (GDP) in Argentina (export elasticity relative to GDP is about 7 for Argentine exports and about 6 for Brazilian exports), but is fairly inelastic relative to GDP in Brazil.

FIGURE 3
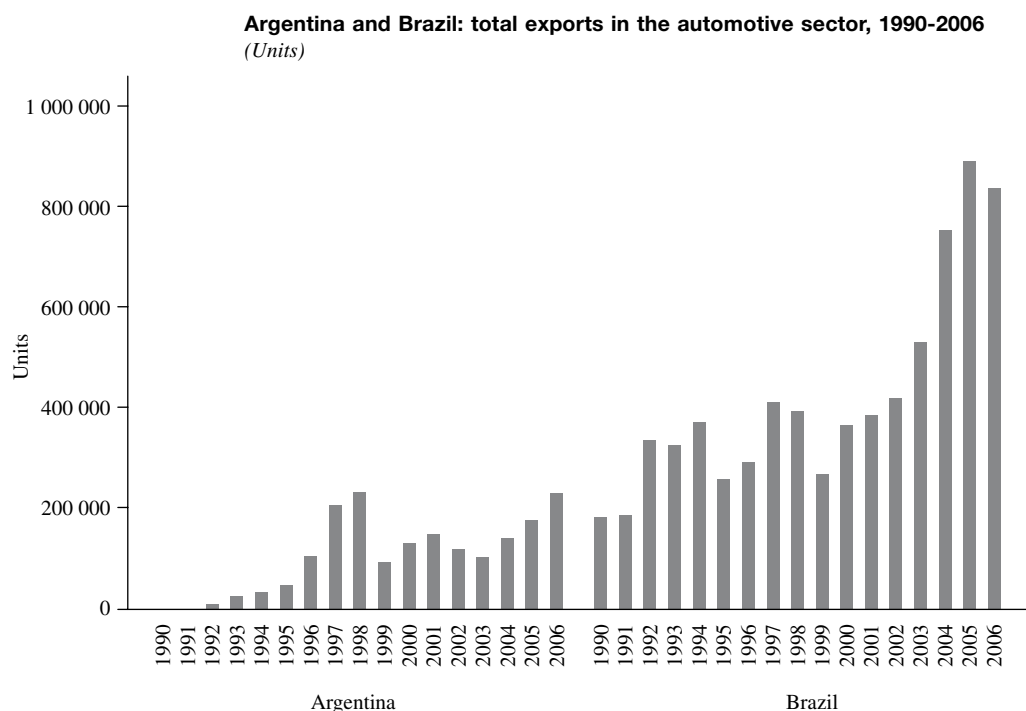
Argentina and Brazil: total exports in the automotive sector, 1990-2006
(Units)

Source: prepared by the author on the basis of data from the Motor Vehicle Manufacturers Association (ADEFA) in Argentina and the National Association of Motor Vehicle Manufacturers (ANFAVEA) in Brazil.

FIGURE 4
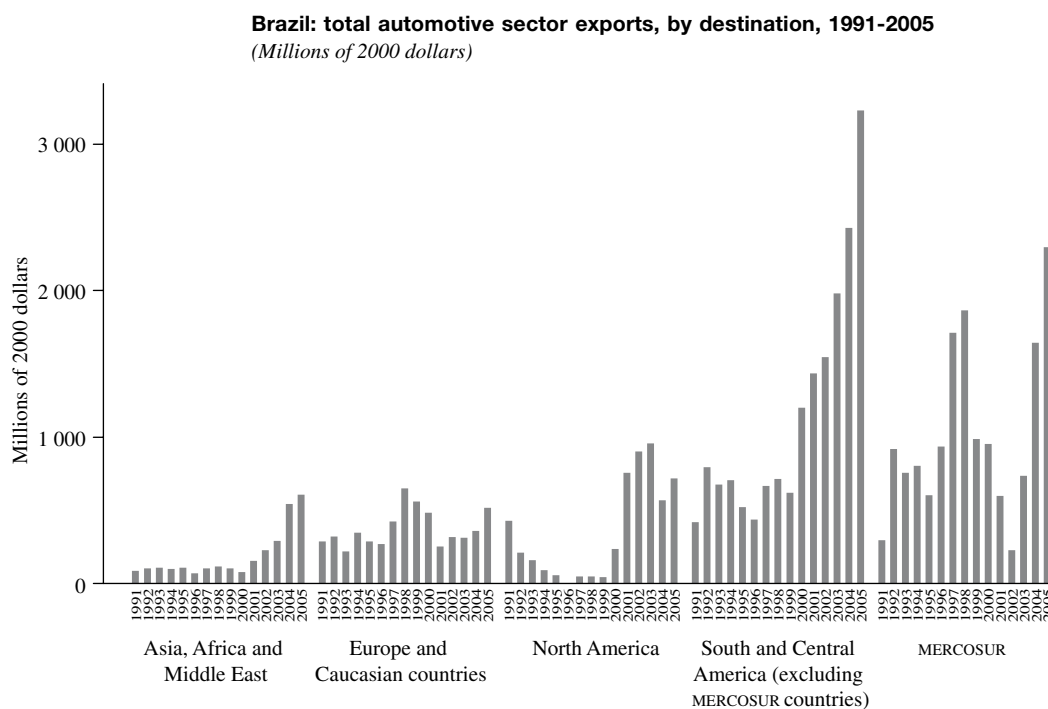
Brazil: total automotive sector exports, by destination, 1991-2005
(Millions of 2000 dollars)

Source: prepared by the author on the basis of the United Nations Commodity Trade Database (COMTRADE).

FIGURE 5

Argentina: total automotive sector exports, by destination, 1991-2005
(Millions of 2000 dollars)

Source: prepared by the author on the basis of the United Nations Commodity Trade Database (COMTRADE).

FIGURE 6

Argentina and Brazil: exports of automobiles to markets with and without preferential trade agreements, 1991-2005
(Millions of 2000 dollars)

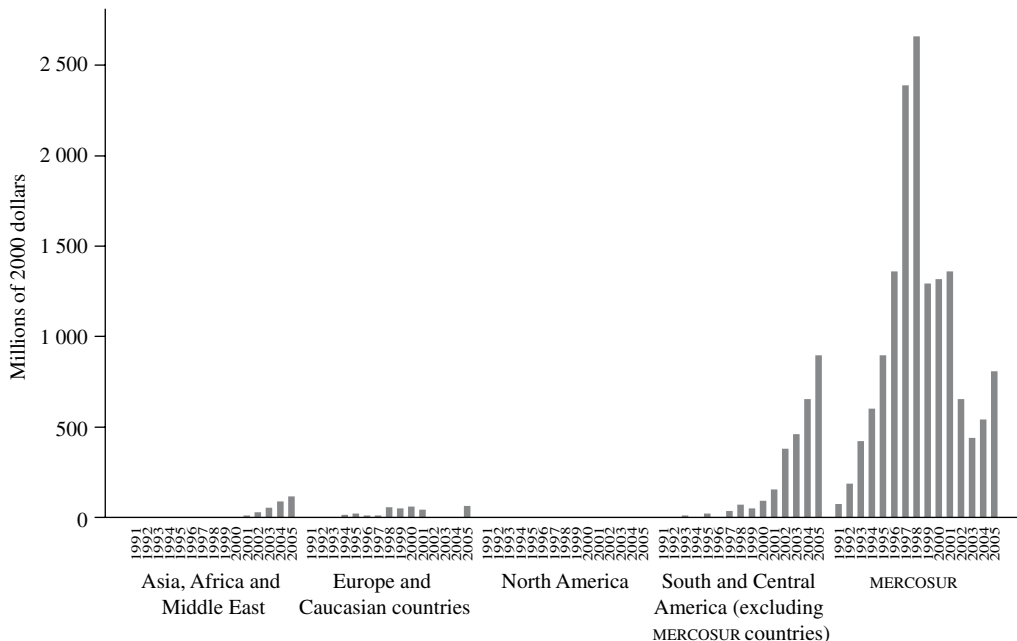*Source:* prepared by the author on the basis of the United Nations Commodity Trade Database (COMTRADE).

FIGURE 7

Argentina and Brazil: export markets, 1991-2005
(Number of markets)

Source: prepared by the author on the basis of the United Nations Commodity Trade Database (COMTRADE).
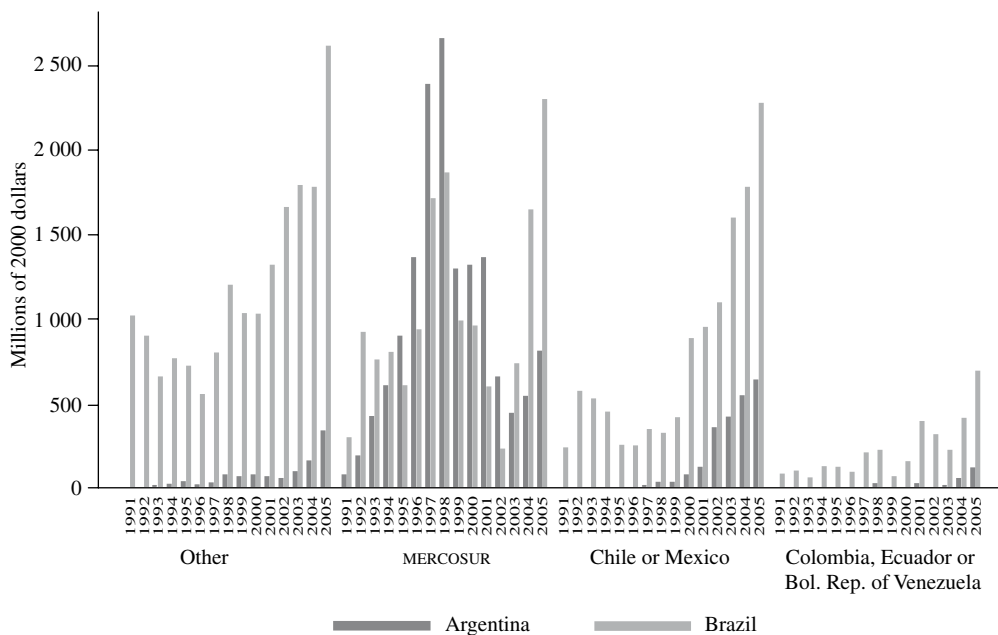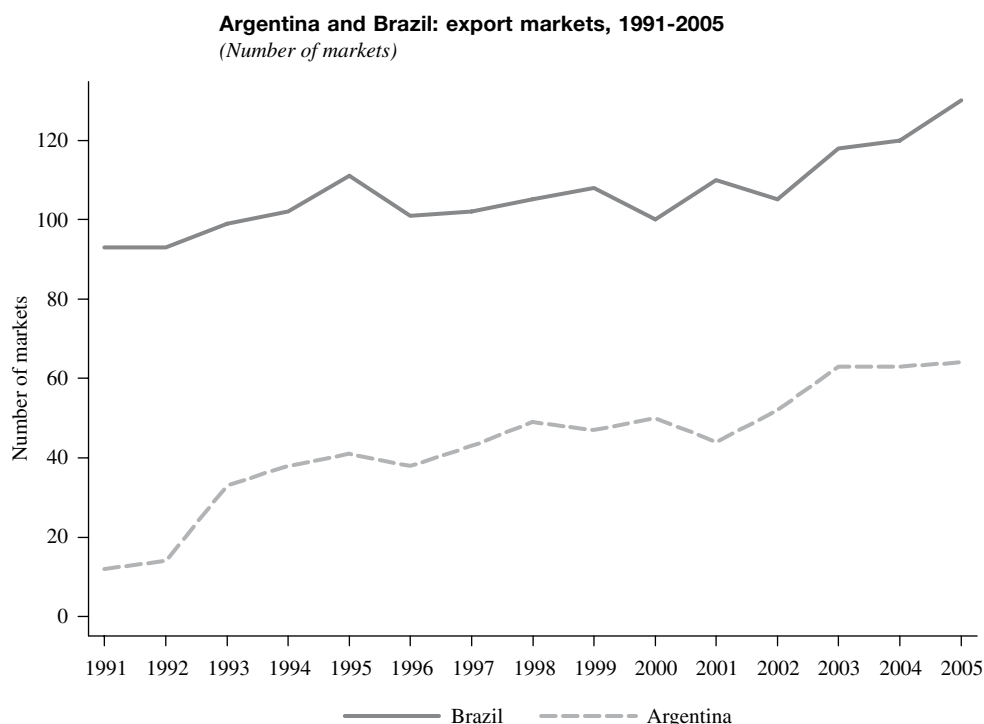
Figure 7 shows the total number of markets exported to by Argentina and Brazil since 1991. As can be seen, Argentina exported automobiles to just 12 markets in 1991, but by 2005 this figure had quintupled to 64 markets. Brazil was already exporting to many more markets in 1991 (93), and in 2005 the figure reached 130. During the "deepening integration" stage, both countries broke their trends and reached a much larger number of markets than before (Argentina in 2001 and Brazil in 2002).

However, market diversification means not just entering new markets but also exporting at similar levels to all of them. In fact, in 2005 some 40% of Argentine automotive exports went to just one country, Brazil, while 28% of all Brazilian exports went to Argentina that year. In other words, the quantities sold to each market were far from balanced, especially in the case of Argentina. This aspect of diversification is represented by an equivalent index built for each country, defined as:
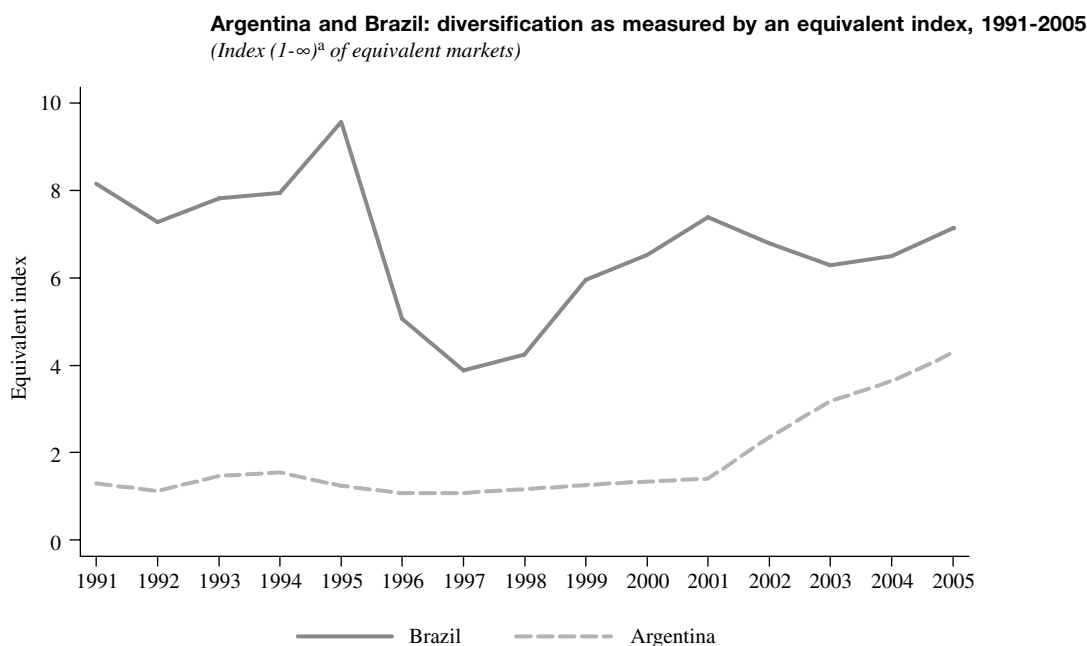
$$F = \frac{1}{\sum_{j}^{n} F_j^2}$$

where F_j is the share of total Argentine or Brazilian exports going to each market j. The index has a minimum value of 1 when all the exports of Argentina or Brazil are sold to a single market. Otherwise, the equivalent index evaluates diversification in terms of the number of markets with equal export shares. For example, Figure 8 shows that export diversification for Argentina in 2005 is equivalent to the diversification of a country that exports equal shares of exports to four markets.[12]

Figure 8 also shows that the level of diversification was roughly stable in Argentina until 2001. In the 1991-1994 period (the "no integration" stage), the index stood at around 1.5. It was somewhat lower (1.2) in the 1995-2000 period (the "towards integration" stage) before climbing to about 3.1 in 2001-2005 (the "deepening integration" stage). In other words, Argentina's exports were largely confined to Brazil before and after the first agreement; during the "deepening integration" stage, however, the industry reached new markets, especially Chile and Mexico (see figure 6).

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[12] The absolute number of the equivalent index F is determined by the total number of markets exported to by each country. Thus, as Brazil exports to more markets, it is expected to have a larger equivalent index. The index could have been standardized by the total number of markets, but the idea was to account not only for equal shares across markets but also for the number of markets each country reached.

FIGURE 8

Argentina and Brazil: diversification as measured by an equivalent index, 1991-2005
(Index (1-∞)[a] of equivalent markets)

Source: prepared by the author on the basis of the United Nations Commodity Trade Database (COMTRADE).

[a]   This means that the index can take values between 1 and infinity.

In Brazil, conversely, diversification diminished sharply after the first agreement (during the "towards integration" phase). The Argentine market began to be the priority then. In 1991, for example, 12% of Brazilian exports went to Argentina and 12% to Chile. In 1996, exports to Argentina represented almost 41% of the total, while exports to Chile had held steady at about 12%. Beginning in 1997, however, the share of Argentina declined as Brazil penetrated new markets. The diversification index consequently rose. In 2005, Brazil attained an equivalent index value of around 7, which was still below the 1991 value of about 8, even though the country was present in some 25% more markets in 2005 than in 1991.

In sum, Brazil outperformed Argentina in output, exports and export market diversification. The equivalent index suggests that similar proportions of its exports go to more markets than is the case with Argentina, which continues to rely heavily on markets with preferential trade agreements.

There are various factors that account for the different patterns of automotive industry development in Argentina and in Brazil. First, from a macroeconomic point of view, the business climate was more predictable in Brazil than in Argentina during the 1989-2005 period

and Argentine exports (and imports) were much more seriously impacted by macroeconomic cycles than Brazilian ones. Second, the regulatory system was designed and enforced differently, and it involved an asymmetric degree of economic aid in each country. Although the automobile sector was supported by both governments, policy support in Brazil has been much more direct and systematic since the origins of the industry, with subsidies and soft credits offered by federal, provincial and even local government institutions (Laplane and Sarti, 2008; Motta Veiga, 2004; Oman, 2000). In Argentina, conversely, regulations were fairly discretionary and sometimes inconsistent, and this compounded the unpredictability of macroeconomic trends. Furthermore, the government rarely enforced the commitments firms had entered into at various times in relation, for example, to export performance. In addition, there was no concerted political effort to develop the value chain, and there was little motivation for subsidiaries to carry out innovative activities in the country (see Arza and López, 2008c, for further details).

Third, there were structural differences between the Argentine and Brazilian industries. The Brazilian market was at least four times as large and its industrial network was more highly developed. Thus, these locations

might have different strategic importance for the global automakers. Furthermore, the size of the domestic market meant that subsidiaries located in Brazil were historically able to achieve greater production scales (and thus production efficiency) than subsidiaries in Argentina. Humphrey and Oeter (2000, p. 63) argue that a scale in excess of 50,000 units can be considered efficient for light vehicle assembly. In 1999, 27 different models of light vehicles were produced in Argentina, and in no case did volume exceed 35,000 units. In Brazil, on the other hand, 44 models were produced, six of them on an efficient scale. In 2006, 17 models were produced in Argentina, two of them on an efficient scale, while in Brazil 43 models

were produced, 15 on an efficient scale. The better use of scales in Brazil is connected with the size of its market, since an average of 68% of the output of each model was sold in the domestic market in 2006; in Argentina, on the other hand, the domestic market absorbed an average of 44% of the output of each model.

The evidence overall points to differences in the performance of the automotive industry in Argentina and Brazil. However, the purpose of this paper is to ascertain the extent to which efforts by firms and governments at the regional level might yield increases in competitiveness in both countries. Sections IV and V below present the research plan employed for this purpose.

IV

Research questions and hypotheses

The empirical data considered above seem to indicate that intra-bloc trade increased during the period after integration began in 1994. In the case of Brazil, this might have happened at the expense of extra-bloc trade. In the case of Argentina, the descriptive evidence suggests that there was genuine trade creation after the first agreement.

Furthermore, both countries' export markets seem to have diversified during the "deepening integration" stage (2000-2005). This would support the hypothesis that MERCOSUR became a production and export platform as a consequence of its regional policies. However, while diversification in Argentina began only during this period, Brazil evinced a historical pattern of increasing diversification that was only briefly interrupted after the first agreement (1994). Again, diversification in Argentina was largely due to exports to markets with which the country had preferential trade agreements, whereas this was not the case with Brazil. An alternative explanation for export market diversification is that the macroeconomic recession in both countries drove them to seek new markets for their surplus output.

This paper examines the role of MERCOSUR agreements (in this case, between Argentina and Brazil) in trade creation and export market diversification.

The research questions are:

Is there any evidence of trade creation after 1994? And after 2000? Are there patterns of export market diversification after those years? Are these patterns similar in Argentina and Brazil? Did diversification come at the expense of intra-bloc trade?

The following hypotheses are proposed:

— Hypothesis 1: After the first MERCOSUR agreement for the automotive industry (1994), there was trade creation in Argentina and Brazil.
— Hypothesis 2: After the second MERCOSUR agreement for the automotive industry (2000), there was trade creation in Argentina and Brazil.
— Hypothesis 3.1: Brazil, Argentina or both have diversified their exports to extra-bloc markets since the signing of their second trade agreement in 2000.
— Hypothesis 3.2: Diversification since the 2000 trade agreement has come at the expense of intra-bloc exports (i.e., it has been associated with the contraction of demand from the intra-bloc partners owing to the macroeconomic recessions in those countries).

V

Methodology

1. The gravity model

This article follows the methodology employed in the integration literature to measure trade creation and diversion resulting from different institutional agreements (Aitken, 1973; Bayoumi and Eichengreen, 1997; Braga, Safadi and Yeats, 1994; Frankel, 1997; Krueger, 1999; Soloaga and Winters, 2001).

Gravity models are inspired by the laws of physics relating to the attraction of objects according to their mass and the distance between them.

$$force\_of\_gravity = G \frac{M_i M_j}{(dist_{ij})^2} \qquad (1)$$

In trade theory, physical attraction is replaced by commercial attraction, which is said to be dependent on country size and the distance between countries (G is a constant term). Size is defined according to the market size of the importer and production capacity of the exporter. Distance, in turn, is defined by barriers (institutional and geographical) and distance (geographical and cultural). Thus, basic gravity models are defined as:

$$\begin{aligned} X_{ij} = &\; \alpha + \beta_1 Y_i + \beta_2 N_i + \beta_3 PC_j + \beta_4 N_j + \\ &\; \beta_5 T_i + \beta_6 T_j + \beta_7 AD_i + \beta_8 D_{ij} + \beta_9 A_{ij} + \\ &\; \beta_{10} I_i + \beta_{11} I_j + \beta_{12} LL_i + \beta_{13} LL_j + \\ &\; \beta_{14-18} CL_{ij} + \varepsilon_{ij} \end{aligned} \qquad (2)$$

where:

$i =$ the importing country.

$j =$ the exporting country.

$X_{ij} =$ imports (in thousands of dollars at constant 2000 prices) to country i from country j (natural logarithms).

$Y_i =$ GDP of the importing country (in dollars at constant 2000 prices) (natural logarithms).

$N =$ population of the importing/exporting country (natural logarithms).

$T =$ land area of the importing/exporting country (natural logarithms).

$PC_j =$ production capacity of the exporting country, defined as the maximum production of the previous five years in dollars at 2000 prices (natural logarithms).

$AD_i =$ average distance between country i and all its export partners, weighted by trade flows (measure of remoteness) (natural logarithms).

$D_{ij} =$ distance between country i and country j in kilometres (natural logarithms).

$A_{ij} =$ dichotomous variable for adjoining countries $i\,j$.

$I =$ dichotomous variable for island countries.

$LL =$ dichotomous variable for landlocked countries.

$CL_{ij} =$ dichotomous variable for common language between countries $i\,j$. This is subdivided into five dichotomous variables for different languages (Arabic, English, French, Spanish and others).

These models have been expanded to cover other aspects, unrelated to size and distance, that affect trade between countries, with the use of dichotomous variables for trade blocs, for example, or indicators of revealed comparative advantage or the evolution of bilateral exchange rates, etc. (Filippini and Molini, 2003; Musila, 2005; Soloaga and Winters, 2001).

The expanded model used in this paper is:

$$\begin{aligned} X_{ij} = &\; \alpha + \beta_1 Y_i + \beta_2 N_i + \beta_3 PC_j + \beta_4 N_j + \beta_5 T_i + \\ &\; \beta_6 T_j + \beta_7 AD_i + \beta_8 D_{ij} + \beta_9 A_{ij} + \beta_{10} I_i + \beta_{11} I_j + \\ &\; \beta_{12} LL_i + \beta_{13} LL_j + \beta_{14-18} CL_{ij} + \beta_{19} RCA_{jj} + \\ &\; \beta_{20-34} BLOC_{ij} + \varepsilon_{ij} \end{aligned} \qquad (3)$$

where the following variables were added to the basic equation (2):

$RCA_{ij} =$ revealed comparative advantage, defined as the ratio between the RCA of country i and the RCA of country j. RCA_i is defined as the share of country i in global car exports relative to the share of country i in global exports of all traded products. When the indicator is greater than 1, country i is said to have a comparative advantage in car production. This variable attempts to measure the competitiveness ratio in car production between the importer and the exporter, and is expected to adversely affect the number of vehicles imported.

$BLOC_{ij}$ = dichotomous variables representing bilateral flows in 15 trade blocs (see annex). These dummy variables can be seen as institutional aids for shortening distances between countries; in other words, countries that are in blocs are expected to trade more between themselves.

To quantify whether trade creation or diversion existed in different circumstances, we employ a set of dichotomous variables to identify trade from, to or between groups of partners. This methodology was originally proposed by Aitken (1973). Since then, a great many empirical studies have employed and improved on the original methodology.

This article employs the methodology proposed by Soloaga and Winters (2001). It will be recalled that the objective is to prove whether trade was created after a particular event (such as the signing of the 1994 and 2000 agreements). Three dichotomous variables are proposed for this method: a first one identifying the bloc when its members import from extra-bloc sources, a second one identifying the bloc when it exports to extra-bloc destinations, and a third identifying intra-bloc trade. To assess whether trade creation took place, the coefficients of these variables before and after the event need to be compared: there will be trade creation when the increase in the third variable is greater than the decrease in the first variable; conversely, there will be trade diversion when the two effects are similar.

2. Data sources and coverage

The United Nations Commodity Trade Database (COMTRADE) is used. This covers bilateral automotive industry trade flows from 1989 to 2006 (ISIC Rev. 2, No. 341). To construct the database used in this study, import flows were taken as the first option, with data on export flows being used to complete any missing information. However, COMTRADE coverage differs over the years, with more missing data in the early years and also in the latest period covered. Consequently, the period was shortened to include only those years in which the data for Argentina and Brazil were reasonably complete (1991-2005).[13]

The following were employed to meet the information requirements of the gravity models:

(i) The World Bank Trade, Production and Protection Database, which contains information on all the independent variables of equation (2) for 100

countries during the 1970-2004 period, except for production capacity.
(ii) The World Bank World Development Indicators, to update time-varying information up to 2005.
(iii) The Industrial Statistics Database of the United Nations Industrial Development Organization (UNIDO), to prepare the production capacity indicator.
(iv) World Trade Organization (WTO) statistical data sets to identify regional integration agreements.
(v) Legal information from the economic affairs ministries of Argentina and Brazil to identify preferential trade agreements with third countries and other information on regulations affecting the automotive industry in the two countries.

Given that information availability differed in each database used, an unbalanced data panel of 59,165 bilateral flows between 1991 and 2005 (between 3,393 and 4,163 bilateral flows a year) was finally constructed to estimate the equations.

3. Testing the hypotheses

To test the hypotheses set out in section IV, the sample was divided into three periods. The first period runs from 1991 to 1994 and represents the "no integration" stage; the second period runs from 1995 to 2000 and covers the whole of the "towards integration" stage. Lastly, the third period runs from 2001 to 2005 and encompasses all of the "deepening integration" stage.

Two different models were estimated to test the above-mentioned hypotheses.

Model 1

This was used to test hypotheses 1 and 2. Three dichotomous variables were developed, as proposed by Soloaga and Winters (2001), and were added to equation (3).

$ARGBRA_{ij}$ is the dichotomous variable identifying trade flows between Argentina and Brazil.

$ARGBRA_i$ is the dichotomous variable identifying other imports into Argentina and Brazil.

$ARGBRA_j$ is the dichotomous variable identifying exports from Argentina and Brazil to other destinations.

Hypothesis 1 is true if there is a significant increase in the $ARGBRA_{ij}$ coefficient between the first and second periods that is not offset by a decrease in the $ARGBRA_i$ coefficient.

Hypothesis 2 is true if there is a significant increase in the $ARGBRA_{ij}$ coefficient between the second and third periods that is not offset by a decrease in the $ARGBRA_i$ coefficient.

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[13] Trade data produced by the national statistics offices of Argentina and Brazil were used to test the completeness of the COMTRADE database.

Model 2

This was used to test hypotheses 3.1 and 3.2. The dichotomous variables included were as follows:

$ARGBRA_{ij}$ = is the dichotomous variable identifying trade flows between Argentina and Brazil.

$ARGCHL_{ij}$ = is the dichotomous variable identifying trade flows between Argentina and Chile.

$ARGMEX_{ij}$ = is the dichotomous variable identifying trade flows between Argentina and Mexico.

$ARGURY_{ij}$ = is the dichotomous variable identifying trade flows between Argentina and Uruguay.

$BRACHL_{ij}$ = is the dichotomous variable identifying trade flows between Brazil and Chile.

$BRAMEX_{ij}$ = is the dichotomous variable identifying trade flows between Brazil and Mexico.

$BRAURY_{ij}$ = is the dichotomous variable identifying trade flows between Brazil and Uruguay.

$ARGBRA_i$ = is the dichotomous variable identifying all other imports into Argentina and Brazil (excluding those already covered by the variables described above, such as those from Brazil, Argentina, Chile, Mexico and Uruguay).

ARG_j = is the dichotomous variable identifying other exports from Argentina (not including those going to Brazil, Chile, Mexico and Uruguay).

BRA_j = is the dichotomous variable identifying other exports from Brazil (not including those going to Argentina, Chile, Mexico and Uruguay).

Hypothesis 3.1 will be true if there is a significant increase in Argentine or Brazilian exports or both to any extra-bloc market (ARG_j, $ARGCHL_{ij}$, $ARGURY_{ij}$, $ARGMEX_{ij}$, BRA_j, $BRACHL_{ij}$, $BRAURY_{ij}$, $BRAMEX_{ij}$) between the second and third periods.

Hypothesis 3.2 is true if there is a decline in intra-bloc trade ($ARGBRA_{ij}$) as large as the combined increase in exports to all other markets between the second and third periods.

In estimating gravity models 1 and 2, the dependent variable was always the natural logarithm of constant import value, and the independent variables were those mentioned in equation (3). As noted above, the difference between models 1 and 2 arises from the different disaggregation of export markets for Argentina and Brazil. Model 1 treats Argentina and Brazil as a bloc and considers not only their intra-bloc trade ($ARGBRA_{ij}$) but also their imports from outside the bloc ($ARGBRA_i$) and exports outside the bloc ($ARGBRA_j$). Model 2 has a twofold purpose. Firstly, it seeks to identify differences between the export patterns of Argentina and Brazil and therefore includes separate dichotomous variables for each of these countries (instead of treating them as a bloc, as

was done in model 1). Secondly, exports to partners with preferential trade agreements are disaggregated, while those to partners without preferential trade agreements are taken together as a category of exports uncovered by such agreements.

The interpretation of the base category (the constant term) is the same in both models. It represents the worldwide bilateral trade that takes place irrespective of the performance of variables included in the models. Since there is no difference in the control variables included in models 1 and 2 (in the latter the dichotomous variable $ARGBRA_j$ of model 1 is divided into eight new variables: ARG_j, *BRA_j*, $ARGURY_{ij}$, $ARGCHL_{ij}$, $ARGMEX_{ij}$, $BRAURY_{ij}$, $BRACHL_{ij}$, $BRAMEX_{ij}$), none of the coefficients of any of the other variables (the constant term included) ought to differ drastically from the estimates of models 1 and 2.

4.   Estimation methods

There are different alternative methods of estimation that could be used to estimate gravity models using panel data. The panel employed in this study includes a maximum of 78 exporting countries and 103 importing countries from all over the world, and covers the 1991-2005 period. Since trade flows relate to a single sector, there could be many bilateral pairs (importing country-exporting country) that have no trade flows in a particular period. This censored characteristic of the database prompted the selection of a Tobit model as a first choice of estimation method.

However, the information gaps in the data set could be due either to a lack of information (nothing is reported when no trade has taken place) or to the absence of bilateral relationships between pairs of countries. To enhance the robustness of the study and avoid listing the value of flows as zero for all missing data, only bilateral relationships in which there was a bilateral flow in at least three years between 1989 and 2006 were retained in the database. Thus, a bilateral relationship could be assumed to exist in all retained cases and a trade flow value of zero was imputed for missing data. In all other cases, it was assumed that no trading relationship existed and they were left out of the analysis. As mentioned, however, the coverage was not distributed in the same way across time. In particular, there were many countries that reported neither imports nor exports in the period before 1994. This implies that the relation imputing zero flows to those first years might have been biased when, in fact, there may have been positive but unreported flows.

A basic bootstrapping procedure of data resampling for periods and bilateral flows yielded inconsistent results for Tobit panel estimations. Consistency was only achieved when the pre-MERCOSUR period was excluded (i.e., when data from 1995 were taken). Given the research question posed, centring the analysis on the 1995-2005 period was not an option.

Consequently, the next best alternative was to keep only positive flows for the analysis, thereby avoiding the imputation of zeros. In this way, an ordinary least squares (OLS) estimate was carried out for the mean value in the years falling within the three different periods identified in subsection 3 of section V.

VI

Empirical findings

1. Robustness of the estimation, goodness of fit and gravity variables

Tables 2 and 3 present the results for models 1 and 2, respectively. As noted, these two models include a different number of dichotomous variables representing extra-bloc trade, and the coefficients for dichotomous variables relating to the export markets of Argentina and Brazil (with subscript j) consequently differ between these two models. However, none of the other variables included in models 1 and 2 changes significantly. This adds to the accuracy of the research design and the robustness of the estimation.

In addition, the goodness of fit of models estimated for different periods is reasonable, with R^2 standing in the range of 39% to 51%.

Beginning the analysis with the variables typical of gravity models, most of these are found to be generally significant and show the right signs. Size and distance are the key variables in gravity models. This analysis employs three dichotomous variables for size and six for distance. The results are generally as expected: size affects trade positively and distance does so negatively. The gravity model was also extended to include a dichotomous variable for the competitiveness of the importer's automotive industry relative to the exporter's (RCA_{ij}) and different dichotomous variables for regulatory tools (trade blocs) that arguably shorten the distance between partners. The results for this group of variables will now be examined:

Size
— When the importer's market size is proxied by GDP there is a strong positive effect on trade. This effect seems to have increased with time. Market size was also proxied by the importing country's

population; in this case, however, opposite though much weaker results were obtained (countries with larger populations import fewer automobiles). This may be related to the low purchasing power of highly populated countries, where automobiles generally cannot be afforded as they are goods with a high income elasticity of demand (luxury goods). The size of the importer's territory is only significant (and positive, although weak) in the last period (2001-2005) analysed here.

— On the exporter's side, size is proxied by production capacity, and this, as expected, has a strong and significant positive effect on trade. Similarly, the population of the exporting country, another dichotomous variable of the exporter's size, also shows a significant and positive, albeit weaker, effect on trade. If the exporter's size is measured by land area, however, the opposite result is seen: smaller exporters trade more. This apparently anomalous finding was to be expected, since automobile producers are largely found in small countries of Europe and Asia. In 2005, in fact, 60% of producer countries, accounting for 53% of global output (not including the production of China and India), were in Asia and Europe.

Distance
— The main variables representing geographical distance are remoteness and the distance in kilometres between partners. The latter is significant and displays a high coefficient with the right sign; a 1% greater distance between partners is associated with 1% less trade. This effect seems to have increased over time. Remoteness (the average distance from all partners) has the opposite effect to the one expected: countries tend to import automobiles from far-off

TABLE 2

Intra-bloc trade: ordinary least squares regression for gravity model 1 estimated for different periods (1991-1994, 1995-2000 and 2001-2005)

	Model 1								
Variable	"No integration" stage 1991-1994			"Towards integration" stage 1995-2000			"Deepening integration" stage 2001-2005		
	Coefficient	P-value	Significance	Coefficient	P-value	Significance	Coefficient	P-value	Significance
lnY_i	0.36	0.00	***	0.40	0.00	***	0.50	0.00	***
lnPC_j	0.58	0.00	***	0.63	0.00	***	0.89	0.00	***
lnN_i	-0.06	0.30		-0.09	0.04	**	-0.11	0.01	*
lnN_j	0.40	0.00	***	0.41	0.00	***	0.22	0.00	***
lnT_i	0.00	0.94		0.01	0.68		0.08	0.01	**
lnT_j	-0.42	0.00	***	-0.41	0.00	***	-0.33	0.00	***
lnAD_ij	0.52	0.00	**	0.44	0.00	***	0.26	0.04	*
lnD_ij	-0.90	0.00	***	-0.93	0.00	***	-1.02	0.00	***
A_ij	1.21	0.00	***	0.67	0.01	**	0.74	0.00	**
I_i	-0.18	0.22		0.07	0.53		-0.01	0.93	
I_j	0.88	0.00	***	0.74	0.00	***	0.94	0.00	***
LL_i	-0.08	0.59		-0.30	0.01	*	-0.35	0.00	**
LL_j	-0.27	0.18		-0.31	0.03	*	-0.25	0.11	
LSp_ij	-0.07	0.76		0.23	0.24		0.47	0.02	*
LEn_ij	0.24	0.24		0.41	0.01	*	0.42	0.02	*
LAr_ij	-1.89	0.04	*	-1.92	0.00	**	-0.90	0.17	
LFr_ij	0.97	0.05	†	1.05	0.00	**	1.88	0.00	***
LOt_ij	2.28	0.00	***	1.78	0.00	**	1.46	0.01	**
andean_bloc_ij	0.20	0.80		1.46	0.04	*	1.20	0.09	†
asean_bloc_ij	-2.09	0.00	**	-0.89	0.05	†	-0.69	0.10	
cacm_bloc_ij	0.86	0.21		1.94	0.00	**	1.95	0.00	**
caricom_bloc_ij	-0.73	0.21		-0.17	0.92		(dropped)		
cemac_bloc_ij	-0.16	0.96		-1.37	0.33		-0.22	0.88	
comesa_bloc_ij	-0.38	0.53		-0.14	0.78		-0.02	0.97	
eccas_bloc_ij	-2.36	0.36		(dropped)			(dropped)		
ecowas_bloc_ij	-2.17	0.23		-0.75	0.09	†	0.86	0.14	
efta_bloc_ij	1.73	0.24		1.15	0.23		1.49	0.13	
eu_25_bloc_ij	2.89	0.00	***	2.89	0.00	***	2.22	0.00	***
gcc_bloc_ij	(dropped)			(dropped)			(dropped)		
nafta_bloc_ij	5.12	0.00	***	6.13	0.00	***	4.93	0.00	***
sadc_bloc_ij	1.87	0.01	**	1.39	0.00	***	1.83	0.00	***
saarc_bloc_ij	-2.37	0.01	**	-1.08	0.12		-0.74	0.33	
waemu_bloc_ij	-2.70	0.39		-0.06	0.94		0.55	0.54	
RCA_ij	-0.0003	0.00	***	-0.0012	0.00	***	-0.0003	0.00	**
ARGBRA_i	0.39	0.25		0.49	0.08	†	-0.30	0.31	
ARGBRA_j	0.06	0.81		0.17	0.43		0.55	0.01	**
ARGBRA_ij	3.56	0.05	†	5.00	0.00	**	4.19	0.01	*
Constant	-11.21	0.00	***	-12.72	0.00	***	-17.51	0.00	***
N	3 013			4 019			3 752		
Adjusted R^2	0.39			0.47			0.51		

Source: prepared by the author on the basis of data from different sources.

† if p < 0.10; * if p < 0.05; ** if p < 0.01; *** if p < 0.001.
Notes: Andean: Andean Community. Asean: Association of South-East Asian Nations. Cacm: Central American Common Market. Caricom: Caribbean Community. Cemac: Economic and Monetary Community of Central Africa. Comesa: Common Market for Eastern and Southern Africa. Eccas: Economic Community of Central African States. Ecowas: Economic Community of West African States. Efta: European Free Trade Association. Eu: European Union. Gcc: Gulf Cooperation Council. Nafta: North American Free Trade Agreement. Sadc: Southern African Development Community. Saarc: South Asian Association for Regional Cooperation. Waemu: West African Economic and Monetary Union. RCA: revealed comparative advantage. ARGBRA: Argentina/Brazil. P-value: probability value.

TABLE 3

Market diversification: ordinary least squares regression for gravity model 2 estimated for different periods (1991-1994, 1995-2000 and 2001-2005)

Variable	Model 2								
	"No integration" stage 1991-1994			"Towards integration" stage 1995-2000			"Deepening integration" stage 2001-2005		
	Coefficient	P-value	Significance	Coefficient	P-value	Significance	Coefficient	P-value	Significance
lnY_i	0.36	0.00	***	0.40	0.00	***	0.50	0.00	***
lnPC_j	0.58	0.00	***	0.63	0.00	***	0.89	0.00	***
lnN_i	-0.05	0.35		-0.09	0.04	**	-0.11	0.01	**
lnN_j	0.40	0.00	***	0.41	0.00	***	0.21	0.00	***
lnT_i	-0.01	0.81		0.01	0.75		0.08	0.01	***
lnT_j	-0.42	0.00	***	-0.41	0.00	***	-0.33	0.00	***
lnAD_ij	0.47	0.00	***	0.41	0.00	***	0.24	0.06	*
lnD_ij	-0.87	0.00	***	-0.91	0.00	***	-1.01	0.00	***
A_ij	1.08	0.00	***	0.56	0.02	**	0.70	0.01	***
I_i	-0.17	0.23		0.08	0.51		-0.01	0.95	
I_j	0.87	0.00	***	0.74	0.00	***	0.93	0.00	***
LL_i	-0.07	0.65		-0.28	0.01	**	-0.35	0.00	***
LL_j	-0.27	0.19		-0.31	0.03	**	-0.25	0.11	
LSp_ij	0.05	0.84		0.29	0.15		0.47	0.03	**
LEn_ij	0.25	0.22		0.41	0.01	**	0.42	0.02	**
LAr_ij	-1.82	0.04	**	-1.88	0.00	***	-0.89	0.18	
LFr_ij	0.98	0.05	**	1.06	0.00	***	1.88	0.00	***
LOt_ij	2.28	0.00	***	1.76	0.00	***	1.47	0.01	***
andean_bloc_ij	0.21	0.79		1.50	0.03	**	1.24	0.09	*
asean_bloc_ij	-1.99	0.00	***	-0.83	0.07	*	-0.66	0.12	
cacm_bloc_ij	0.84	0.22		1.96	0.00	***	1.98	0.00	***
caricom_bloc_ij	-0.73	0.68		-0.17	0.92		(dropped)		
cemac_bloc_ij	-0.02	0.99		-1.22	0.39		-0.17	0.91	
comesa_bloc_ij	-0.33	0.58		-0.12	0.81		-0.01	0.98	
eccas_bloc_ij	-2.29	0.37		(dropped)			(dropped)		
ecowas_bloc_ij	-2.00	0.27		-0.68	0.12		0.89	0.13	
efta_bloc_ij	1.76	0.23		1.15	0.23		1.48	0.13	
eu_25_bloc_ij	2.92	0.00	***	2.91	0.00	***	2.22	0.00	***
gcc_bloc_ij	(dropped)			(dropped)			(dropped)		
nafta_bloc_ij	5.25	0.00	***	6.23	0.00	***	4.98	0.00	***
sadc_bloc_ij	1.97	0.01	***	1.47	0.00	***	1.86	0.00	***
saarc_bloc_ij	-2.27	0.00	***	-0.99	0.15		-0.70	0.36	
waemu_bloc_ij	-2.82	0.37		-0.08	0.92		0.54	0.54	
RCA_ij	-0.0003	0.00	***	-0.0012	0.00	***	-0.0003	0.00	***
ARGBRA_i	0.31	0.38		0.40	0.17		-0.39	0.19	
ARG_j	-1.01	0.02	**	-0.80	0.02	**	0.12	0.74	
BRA_j	0.43	0.15		0.59	0.03	**	0.60	0.03	**
ARGBRA_ij	3.92	0.03	**	5.43	0.00	***	4.91	0.00	***
ARGURY_ij	2.93	0.11		1.76	0.29		0.17	0.92	
ARGCHL_ij	1.29	0.48		1.73	0.30		0.79	0.64	
ARGMEX_ij	-2.05	0.26		1.18	0.48		3.36	0.05	**
BRAURY_ij	2.46	0.17		4.08	0.01	**	2.12	0.21	
BRACHL_ij	2.48	0.17		1.39	0.40		1.64	0.33	
BRAMEX_ij	3.08	0.09	*	3.92	0.02	**	4.27	0.01	**
Constant	-11.03	0.00	***	-12.52	0.00	***	-17.34	0.00	***
N	3 013			4 019			3 752		
Adjusted R^2	0.39			0.48			0.51		

Source: prepared by the author on the basis of data from different sources.

† if p < 0.10; * if p < 0.05; ** if p < 0.01; *** if p < 0.001.
Notes: Andean: Andean Community. Asean: Association of South-East Asian Nations. Cacm: Central American Common Market. Caricom: Caribbean Community. Cemac: Economic and Monetary Community of Central Africa. Comesa: Common Market for Eastern and Southern Africa. Eccas: Economic Community of Central African States. Ecowas: Economic Community of West African States. Efta: European Free Trade Association. Eu: European Union. Gcc: Gulf Cooperation Council. Nafta: North American Free Trade Agreement. Sadc: Southern African Development Community. Saarc: South Asian Association for Regional Cooperation. Waemu: West African Economic and Monetary Union. RCA: revealed comparative advantage. ARGBRA: Argentina/Brazil. ARGURY: Argentina/Uruguay. ARGCHL: Argentina/Chile. ARGMEX: Argentina/Mexico. BRAURY: Brazil/Uruguay. BRACHL: Brazil/Chile. BRAMEX: Brazil/Mexico. P-value: probability value.

partners. This could be because the United States and Japan, two countries that are fairly remote from the rest of the world, have highly diversified markets and large shares of global exports.[14] The dichotomous variable for cultural distance was language. Sharing the same language became an important factor in trade only during the latest period (countries where Arabic is spoken were an exception, probably because of their very low share of automobile output).

Revealed comparative advantage
— These variables have the expected negative signs; the more competitive the importer is relative to the exporter, the lower the level of trade between them.

Blocs
— Most of the significant dichotomous variables have the expected signs, indicating that the regulations of trade agreements have helped to shorten distances.[15]

2. Evidence in support of the paper's main hypotheses

As can be seen in table 2, Argentina and Brazil traded more with each other than predicted by the expanded version of the gravity model ($ARGBRA_{ij}$ is significant and positive in all periods). More precisely, in the 1991-1994 period Argentina and Brazil traded 34 times as much as would be expected from the gravity model.[16] In the second ("towards integration") stage, however, after the two countries signed their trade agreement in December 1994, there was 147 times as much trade between them as predicted by the gravity model. In other words, the agreement seems to have had a very large effect on intra-bloc trade.[17] In the third stage ("deepening integration"), intra-bloc trade was lower than in the previous period; even so, Argentina and Brazil traded 65 times as much as predicted by the gravity model.

Figure 9 shows the evolution of the coefficients of intra-bloc trade between Argentina and Brazil when the gravity model equations are estimated by year. As can be seen, trade between these two countries began to expand in the early 1990s; however, it was not until after the first agreement (in late 1994) that Argentina and Brazil traded a significantly greater volume than would have been expected from the gravity equation. This effect was most pronounced in the 1996-1998 period. In 1999, the Brazilian recession may have diverted Argentine exports to other destinations; a decline in intra-bloc trade was then observed at the time of the Argentine crisis in 2002. These macroeconomic factors may explain which the second agreement signed in 2000, when integration between Argentina and Brazil was deepened, did not increase intra-bloc trade as expected.

Thus, the evidence seems to refute hypothesis 2 but not hypothesis 1. To conclude that there was trade creation after the 1994 agreement, however, it is necessary to determine whether the increase in the intra-bloc trade coefficient offset the decrease in the extra-bloc trade coefficient, as measured by the variable $ARGBRA_i$. Table 2 shows that there was no decline in extra-bloc trade after 1994 and that hypothesis 1 therefore cannot be rejected. In other words, trade was created for Argentina and Brazil after the first agreement in 1994. This did not happen after the agreement signed in 2000 (i.e., the evidence supports hypothesis 1 but not hypothesis 2).

Exports to other destinations during "deepening integration" (stage 3) were 73% (=exp(0.55)-1)*100) higher than anticipated from the gravity model. In stages 1 and 2, these countries exported only about as much to other destinations as would be expected from the gravity model (i.e., the $ARGBRA_j$ coefficients were not significant). The significance of the $ARGBRA_j$ coefficient in stage 3 seems to indicate that extra-bloc markets were particularly important for the exports of Argentina and Brazil during the "deepening integration" stage. However, the difference between this coefficient and those of stages 1 and 2 is not significant. Although this might be explained statistically by the large standard deviation of the coefficients in the first and second periods, it cannot be categorically stated that Argentina, Brazil or both diversified their export markets after the 2000

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[14] Furthermore, this coefficient changes sign if zero values are included in the Tobit models. Remoteness thus seems to have a negative effect on the creation of new bilateral relationships, but not necessarily on the intensification of trade between established partners.

[15] The only exception is the bloc of ASEAN countries, which seem to have traded less with one another than predicted by the gravity model, especially in the first two periods. This finding seems to be due to two factors. First, the bloc's trade deficit in those years was over 100% (between them, the countries imported more than twice as much as they exported), meaning that most imports came from outside the bloc. Second, the main producers in ASEAN (Indonesia, Malaysia and Thailand) exported mainly to destinations outside the bloc.

[16] Because the model was estimated in logarithms, the effect of the dichotomous variable is given by the formula: =(exp(dichotomous variable coefficient)-1*100 (if expressed as a percentage). In the case above, =(exp(3.56)-1)=34.

[17] The difference in the coefficient for $ARGBRA_{ij}$ between the first and second periods is significant (p-value of 0.06).

FIGURE 9

Coefficients for ARGBRA$_{ij}$ dichotomous variables in ordinary least squares estimations of the gravity equation per year, 1990-2005

◆ Significant at 5%   ■ Significant at 10%   ▲ Not significant
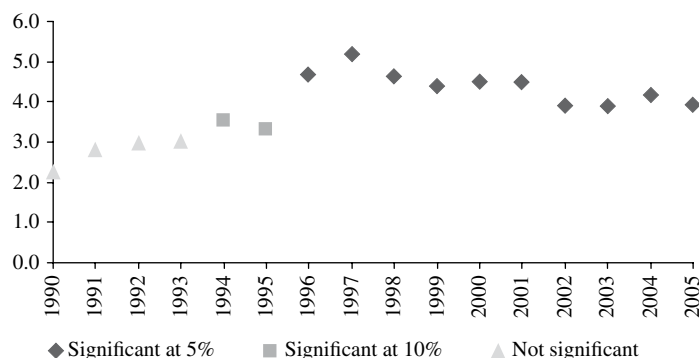
Source: prepared by the author on the basis of data from various sources (see section V, number 2).

agreement (either in consequence of the change of regime that initiated the "deepening integration" stage or because of macroeconomic upheaval). Consequently, while extra-bloc markets became quite important in this period, the available evidence seems to refute hypotheses 3.1 and 3.2 when Argentina and Brazil are treated as a single bloc.

The information presented in table 3 helps to differentiate the export strategies followed separately by Argentina and Brazil, and can thus be used to test hypotheses 3.1 and 3.2 for each country. Table 3 shows the results of the model 2 estimates, concentrating particularly on markets that have been recently supported by trade regulation.

Among markets with preferential trade agreements, Mexico is the only one to have become an increasingly important partner for both Argentina and Brazil. First, Argentine exports to Mexico were significantly different from the gravity predictions in period 3. Second, Brazilian exports to Mexico were always higher than expected from the gravity model and increased further over time. Differences in coefficients between time periods are not significant in either country.

The trade of Chile with Argentina and Brazil was no greater than would be expected from the gravity model. That of Uruguay was greater than predicted by the gravity model only in the case of Brazil after the signing of the 1994 agreement.

As for Argentina and Brazil's other export markets, in stages 1 and 2 Argentina can be seen to have exported less than predicted by the gravity model to other markets (ARG$_j$) with which it did not have preferential trade agreements as specified by the gravity model. In stage 3, the coefficient was no longer negative, but nor was it significant. Brazil, on the other hand, displays positive

and significant coefficients for BRA$_j$ in stages 2 and 3, reflecting more intensive use of strategies to diversify beyond markets with preferential trade agreements. Furthermore, an exercise similar to this one but carried out on the model 1 exercise (for example, by dividing the dichotomous variable ARGBRA$_j$ into ARG$_j$ and BRA$_j$) yields the same results.

In sum, regarding assumption 3.1 (export diversification increased in stage 3), the evidence seems to show that:

(i)   Argentina exported more to Mexico in this period than predicted by the gravity model, but not in earlier periods.

(ii)   Brazil always exported more to Mexico than would be expected from the gravity model, and this effect tended to increase over time.

(iii) Brazil exported more than predicted by the gravity model to markets without preferential trade agreements in stages 2 and 3. The differences between periods were not significant, however, which means that these effects cannot be associated with any particular change in 2000.

To sum up, there appears to be no evidence of greater trade diversification after 2000, whether because of the signing of the 2000 agreements or the recession in MERCOSUR. Consequently, hypothesis 3, in both its 3.1 and 3.2 forms, also needs to be rejected when Argentina and Brazil are analysed separately. Hypothesis 3.1 (e.g., diversification into new markets after the 2000 agreement) is rejected because exports to extra-bloc markets were not systematically higher in stage 3 than in stage 2. Hypothesis 3.2 (i.e., diversification came at the expense of intra-bloc trade) is rejected on the same grounds as hypothesis 3.1 and also because intra-bloc

trade (ARGBRAij) did not change significantly between stages 2 and 3.

Lastly, while hypotheses 3.1 and 3.2 have been rejected, there is some evidence for the growing importance of Mexico vis-à-vis intra-bloc trade. Intra-bloc trade in stage 2 was considerably greater than that between Argentina or Brazil and any other partner with a preferential trade agreement, including Mexico. In stage 3, however, although the intra-bloc trade results were greater than those for any other partnership, the intra-bloc coefficient is not much different from the trade coefficient between Mexico and Argentina or between Mexico and Brazil. In other words, Mexico seemed to increase in importance (relative to intra-bloc trade) as an export market for Argentina and also for Brazil. This is not the case with Uruguay, a partner whose relative importance declined, or with Chile, whose relative importance was roughly stable over time.

VII

Conclusions

The trend towards internationalization of the global automotive industry has intensified since the 1990s and includes global and regional strategies. Regional strategies are said to be more efficient because the trade-off between efficient scale and product differentiation is more balanced.

MERCOSUR has a long history as a location for automotive production. For example, some subsidiaries of multinational corporations began producing earlier in the region than in more developed places. MERCOSUR is now a major area in terms of its share of both global output and exports.

However, the region has not yet achieved full integration for the industry. The main reason for the lack of a full agreement in the automotive industry is that the members of MERCOSUR have not reached a consensus on the common external tariff (Argentina and Brazil prefer higher tariffs, while Uruguay and Paraguay prefer lower tariffs).

This is now one of the few sectors in which Argentine-Brazilian trade is administered by a series of agreements entailing different degrees of intervention. The first of these agreements was reached in 1994 and began what this article has called the "towards integration" stage. The second agreement, signed in 2000, was more committed to regional integration and established the beginning of the "deepening integration" stage. In 2006 and again in 2008, however, agreements were signed that set back intra-bloc integration in one way or another ("reversing integration" stage). Intra-bloc free trade was postponed until 2013, chiefly owing to Argentine concerns about competition from Brazil.

All these agreements tended to favour strategies of complementation within the multinational corporations located in the two countries. To some extent this was achieved during the "deepening" stage, as discussed by Arza and López (2008b) when studying the Argentine case.

The purpose of this paper was to analyse the extent to which MERCOSUR (defined as Argentina and Brazil only) has been turned into an export platform for automotive production. More specifically, the objective was to examine whether trade was created after the trade agreements of late 1994 and 2000, and whether the two countries diversified their exports to other markets during the "deepening integration" stage (2000-2005).

The methodology proposed (estimation of an expanded gravity equation) required the construction of a large database with information from different sources. Once all the variables needed for the estimation had been assembled, an unbalanced database was created with a maximum of 78 exporting countries and 103 importing countries, with measurements of trade flows in the 1991-2005 period. To meet the research objective, the sample was divided into three periods (before and after the 1994 and 2000 trade agreements) and two different versions of the gravity model were estimated. The difference between the models is that the second disaggregates extra-bloc exports more extensively.

The conclusion from the empirical analysis was that genuine trade creation did take place after the 1994 agreement. Argentina and Brazil traded more with each other than predicted by the gravity model. Furthermore, intra-bloc trade increased significantly after 1994 (i.e., between periods 1 and 2), without harming extra-bloc trade. Possibly as a result of the recession in Brazil (and Argentina) in 1998-1999 and the Argentine crisis of 2001-2002, however, the 2000 agreement did not lead to a large rise in intra-bloc trade.

The descriptive evidence shows that after the signing of the second agreement in 2000 (during the "deepening integration" stage), the region apparently exported more than before to other destinations. In Brazil, furthermore, a more aggressive diversification strategy was applied to exports, which expanded beyond the markets covered by preferential trade agreements. This may be because the bloc was turning into an export platform following the enhanced agreement between Argentina and Brazil in 2000, or because both countries suffered macroeconomic upheavals in those years and so had to look for extra-bloc markets. While the econometric estimates show that extra-bloc trade (Argentina's mainly going to Mexico but Brazil's also to countries without preferential trade agreements) was greater than predicted by the gravity model and actually increased in the period, this rise was not statistically significant.

To sum up, there is evidence of trade creation after the 1994 agreement, although the same did not happen after the agreement signed in 2000. Trade creation is accounted for mainly by the rise in intra-bloc trade. Although the export share of countries outside the bloc progressively increased, there is not enough evidence to claim that Argentina or Brazil succeeded in systematically increasing their access to extra-bloc markets after the signing of the integration agreements. In other words, to judge by the evidence gathered up to 2005, the 2000 MERCOSUR agreements were not successful at that time in turning the region into a platform for exports to other extra-bloc markets.

(Original: English)

ANNEX

Selected regional integration agreements

Andean Community:	Colombia, Ecuador, Peru and Plurinational State of Bolivia.
ASEAN (*Association of South-East Asian Nations*):	Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.
CACM (*Central American Common Market*):	Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua.
CARICOM (*Caribbean Community*):	Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname and Trinidad and Tobago.
CEMAC (*Economic and Monetary Community of Central Africa*):	Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon.
COMESA (*Common Market for Eastern and Southern Africa*):	Angola, Burundi, Comoros, Congo, Democratic Republic of the Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Namibia, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe.
ECCAS (*Economic Community of Central African States*):	Angola, Burundi, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, Rwanda and São Tomé and Príncipe.
ECOWAS (*Economic Community of West African States*):	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.
EFTA (*European Free Trade Association*):	Iceland, Liechtenstein, Norway and Switzerland.
EU 15 (*European Union (15 countries)*):	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.
EU 25 (*European Union (25 countries)*):	Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovenia, Slovakia, Spain, Sweden and the United Kingdom.
GCC (*Gulf Cooperation Council*):	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates.
MERCOSUR (*Southern Common Market*):	Argentina, Brazil, Paraguay and Uruguay.
NAFTA (*North American Free Trade Agreement*):	Canada, Mexico and the United States of America.
Preferential Trade Agreement of the South Asian Association for Regional Cooperation (SAARC):	Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.
SADC (*Southern African Development Community*):	Angola, Botswana, Democratic Republic of the Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, United Republic of Tanzania, Zambia and Zimbabwe.
WAEMU (*West African Economic and Monetary Union*):	Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo.

Source: selected by the author on the basis of World Trade Organization (WTO) statistical data.

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