Multinational Companies in MERCOSUR: Building Up a Peripheral and Hierarchical Regional Automotive Space

The aspirations for economic modernization embraced by the MERCOSUR integration process relied on two fundamental assumptions: firstly, that the enlargement of domestic markets to a broader regional space would allow for a progressive specialization in sectors with a greater capacity to create and disseminate knowledge; secondly, that subsidiaries of multinational companies (MNCs) would be the main driving agents of such a process of technological change.[1] These were two of the main pillars of the so-called "open regionalism" model as the Economic Commission for Latin America and the Caribbean (ECLAC) referred in 1994 to this new type of integration –in contrast with "closed" or "old" regionalism initiatives of the 1960s.

As a matter of fact, the MERCOSUR initiative was subordinated to a broader process of market-oriented structural reform programs adopted by Latin American countries in the 1990s –the so-called Washington Consensus reforms.[2] In brief, among other measures, the reforms entailed, an accelerated process of unilateral trade opening, the removal of controls on international capital flows, and the privatization of most state-owned companies,.[3]

Conceptually, the economic reform agenda was informed by neo-liberal ideas which had spread out from the United States and the United Kingdom and in a few years gained influence in the rest of the world.[4] To summarize, this conceptual frame assumed that the private sector was, under any circumstance, more efficient that the public sector and that, once deregulated and liberalized, the market would make an "efficient" allocation of resources that would "maximize" the overall well-being of society.

Within this conceptual framework, the role of states in open regionalism initiatives was essentially constrained to the regulation of the regional market space. They were to focus mainly on facilitating investment flows as well the free circulation of goods and services and. It was expected that this would create the conditions for foreign direct investment to localize in the region and for subsidiaries of MNCs to operate as "carriers of modernization". They would bring to the South American 'peripheral' region modern consumption and capital goods, world class manufacturing practices, managers educated in top business universities, and so forth. The virtues of leading-edge knowledge embedded in goods, services, practices and people would, as it was anticipated, spill over into backward economic structures through different mechanisms: competition, collaboration, training, etc.[5]

Building upon the findings of extensive empirical research on the automotive industry in MERCOSUR[6] covering the period 1991-2011, this article presents a skeptical view of the modernizing capacity of MNCs.[7] Since the two largest vehicle manufacturers in the region located in Argentina and Brazil are MNCs the case of the automotive sector is particularly apposite for a discussion of issues to do with the conditions of modernization. The research project dealt with three specific issues. Firstly, it explored the extent to which subsidiaries of

MNCs companies hosted in the region were able to act as carriers of modernization, as originally predicted. In other words, it analyzed whether they had carried out a sustained process of technological learning that had allowed them to bridge the gap with other units of the corporation located in more advanced countries. The second question examined concerned the role of individual subsidiaries located in Argentina and Brazil in the knowledge-creating activities carried out within the region. The purpose was to evaluate the extent to which the particular intra-regional division of labor among subsidiaries contributed to a balanced distribution of the benefits of technological progress, as stated in the Treaty of Asunción.

From a different angle, it can be stated that whereas the first question is concerned with the relative position of subsidiaries operating in the MERCOSUR region *within the intra-corporate division of labor*; the second one regards the division of labor among the subsidiaries operating *within the region*.

From these two questions emerged a third one: what were the driving agents shaping the behavior of MNCs in the region? Was the technological behavior of MNC subsidiaries in the region controlled by their parent companies overseas, or had they had some autonomy to carry out their own in-house initiatives? In which way did the regulatory framework adopted by governments affect the technological behavior of MNCs in the region?

These specific problems are clearly directly related to the fundamental issues that have exercised the minds of those scholars concerned with development issues for more than sixty years. Which are the driving agents of economic modernization in peripheral countries? What are the potentialities and limitations of relying upon MNCs to lead such a process? What is the role of the state in encouraging the modernization of the economic structure? What are, in particular, the opportunities and threats posed by collective regional projects to the modernizing aspirations of individual member countries?[8]

The article is organized as follows: the first two sections discuss the main trends of the global reorganization experienced by the automotive industry in the last two decades at a global and regional level, respectively. The third section briefly presents the main elements of the research project's design and analytical tools. The following sections address the research questions posed above through the examination of three cases studies.

1. Reorganization of Global Automotive Networks: the Emergence of "Regional Automotive Spaces"

Since the early 1990s, the automotive industry has undergone a major reorganization at world level.[9] In such a process, three interrelated developments are worth pointing out here, as they are critical to an understanding of the dynamics which have unfolded in MERCOSUR in the last two decades: firstly, the emergence of new consumption and production centers outside affluent countries in the so-called Triad region;[10] secondly, the regionalization of automotive production

networks; and thirdly, the new roles assumed by some subsidiaries located in emerging countries within the corporate division of labor.

1.1 Balancing the Global Map

World vehicle production and consumption levels have experienced significant growth since the mid-1980s, from around 45 million units to almost 80 million units in 2011. Interestingly, this growth, however, is accounted for by traditional vehicle producers in Triad countries, but by a group of 'emerging' countries. This has significantly changed the boundaries of the global automotive map: whereas in the early 1990s a small group of affluent regions accounted for about 75% of total consumption and 85% of production of vehicles at a world level, their participation has in recent times come down to less than 40%.[11] Countries such as South Korea, India, Mexico, Brazil and China especially, are among the emerging countries with the most outstanding performance.

Changes in global consumption and production patterns are largely explained by a series of concurrent "push" and "pull" forces. One of the main push forces was the saturation of Triad mature markets with very low ratio inhabitants/vehicles.[12] An important "pull" force attracting the establishment and expansion of manufacturing facilities in emerging countries was the relatively better economic performance of this group of countries in the last two decades in comparison with high-income economies. In particular, the acceleration of the GDP growth rates in a group of developing regions with a high number of inhabitants per vehicle (e.g. Brazil, China, and India) resulted in the emergence of a large 'new middle class' with an increasing consumption capacity, including the ownership of a first vehicle.

The geographical expansion of carmakers towards new emerging regions was certainly favored by the relaxation of restrictions on trade and capital flows.[13] The more market-friendly regulatory environment furthered by the implementation of the so-called Washington Consensus structural reforms did not only facilitate the establishment of manufacturing facilities but also boosted domestic consumption levels –financed to a great extent by borrowing in foreign financial markets.

1.2 Regionalization of Automotive Networks

The geographical transformation of the car industry also involved the reconfiguration of spaces around which automotive networks were organized. With the partial exception of Europe, where strategies of regional scope were already put in place in the 1960s, automotive production networks –both in Triad and non Triad countries– were until the 1980s approximately mainly organized around national markets.[14] In a nutshell, this meant that the chain of production was highly vertically integrated and mostly localized within national boundaries. The bulk of sales

targeted the country where vehicles were produced and exports were primarily considered as a complement to local sales.[15]

From the 1990s, with the exception of some large protected national markets –in particular China and India–, regional areas, as a consequence of normative and technological changes, consolidated as the preferred space for carmakers to organize their production and commercialization networks.[16] The proliferation of trade preferential agreements among neighboring countries –or the deepening of those already existing–, such as the EU, NAFTA, ASEAN and MERCOSUR certainly contributed to accelerating the process, as they reduced the costs for intra-regional trade flows.[17]

This organizational reconfiguration entailed an extraordinary expansion of the scale of production and the emergence of different types of regional 'automotive spaces'. Humphrey *et al*. identify two main types of regional automotive spaces: peri-central and peripheral regional integration.[18] The first one corresponds to automotive networks organized around one or more countries belonging to the group of Triad nations. Networks are led by MNCs whose main motivation for internationalizing their manufacturing activities is to take advantage of differences in wage and capital costs among geographically close countries. In North America, this has been the case of the automotive production network organized within NAFTA, which includes the US, Canada and Mexico. A similar process of delocalization of production was carried out by carmakers from Western Europe once former Central and Eastern European communist countries in the early 1990s initiated a process of economic structural reforms and –for some of them– their accession to the EU.

The case of MERCOSUR corresponds to what Humphrey *et al*. refer to as peripheral regional integration. It refers to emerging regions where automotive MNCs from Triad nations put in place business strategies with the main objective of exploiting emerging regional markets. In peripheral integration schemes, automotive subsidiaries operating in various countries of the regional area generally specialize in different product lines (or "vehicle platforms"[19]) in order to attain more efficient scales of production. Production is then commercialized within the region through intra-firm exchanges. It is worth noting that the leading agents of automotive networks built around peripheral spaces –i.e. parent companies– are located outside of the region's boundaries.

1.3 A New Role for Automotive Subsidiaries in Emerging Countries

With the emergence of new centers and the reorganization of automotive networks around regional automotive spaces, MNCs devised new types of product policies which impacted on their intra-firm division of labor. The first type of new product policies consolidated in recent decades consisted in the development of "world vehicles" or "global platforms".[20] This policy entailed the development of models that are manufactured and commercialized with minor variations in many different countries. Under this policy, the global network of the corporation is

more closely integrated. This encouraged convergent trajectories for those different "national" models, which contrast with their divergent trajectories in the past.

From the perspective of the intra-firm division of labor, this type of strategy reinforced center/periphery schemes. Local engineering teams, who in the past had the mission of adapting vehicles to national automotive spaces and extending the life-cycle of models for many years, were significantly downsized. Product engineering functions were fundamentally concentrated in the parent company.

The second type of corporate strategy developed from the 1990s on corresponds to so-called differentiated product policies. In this case, specific models or family of vehicles sharing the same platforms started to be developed for their exclusive commercialization in emerging regions. This allowed carmakers to meet a heterogeneous demand coming from clients with different consumption profiles as defined by their income levels, tastes, etc. The diversification of product policies to meet different client profiles prevailing in various destination markets created pressures for a reorganization of the intra-firm division of labor. Progressively headquarters gave some selected subsidiaries operating in emerging countries product development mandates of varying complexity. Local engineering teams in subsidiaries proved capable of cutting down development time and costs. Furthermore, they had the ability of better grasping the tastes of local consumers and, therefore, of developing products better tailored to preferences prevailing in host regions.[21]

This intra-firm reorganization resulted in a more diversified division of labor. A new type of 'semi-peripheral'[22] subsidiary emerged: a unit which upgraded its relative position in the corporate hierarchy, assuming more knowledge-intensive product development responsibilities. Moreover, when operating within regional automotive spaces, semi-peripheral units undertook management responsibilities over the rest of the subsidiaries operating in the same region.

2. Reorganization of the MERCOSUR Automotive Network: Expansion, Modernization and Regionalization

2.1 A Brief Account of the Evolution of the MERCOSUR Automotive Regulatory Framework

Within the framework of the structural reform process of the early 1990s, the governments of Argentina and Brazil actively intervened in the reconfiguration of the car industry. In the early 1990s, the two countries put in place sectorial policies intended to boost the depressed demand levels for vehicles.[23] At the same time, they created incentives for firms operating in the region to modernize their production lines and expand their production capacity, protecting them from foreign competition.[24]

Besides efforts deployed at the national level, from the very launch of MERCOSUR in 1991, Argentina and Brazil also sought to put in place a joint regulatory framework to promote the integration of the local automotive industries.

During the first half of the 1990s, the bilateral framework was restricted to a system of export quotas allocated among individual firms operating in the two countries.[25] This scheme sought to avoid significant intra-regional commercial imbalances. Over the years, as the car industry expanded, the two governments progressively eased the restrictions on bilateral trade.

In 1994, Argentina and Brazil agreed in Ouro Preto on a commitment to advance with the creation of a MERCOSUR common automotive market by 2000. In the meantime, the bilateral trade of vehicles was partially liberalized on the basis of the following rules:

- the commercial exchange of vehicles between Argentina and Brazil was free of tariffs, provided that imports were compensated for with exports to any destination, according to the rules established in the legislation of each country.
- both countries recognized the auto parts produced in the other country as nationally produced parts for the purpose of calculating the minimum domestic content, provided that imports were compensated for with exports to any part of the world.

In December 1999, when the agreement on the automotive sector in MERCOSUR was about to expire, Argentina and Brazil had not yet arrived at a common position on the creation of the common market they had committed to in Ouro Preto. I n June 2000an agreement between the two countries was Finally, reached, whose spirit has governed the MERCOSUR automotive space until today. The agreement established a set of specific conditions under which vehicles and auto parts could be freely exchanged between the member countries. Some of the provisions most relevant for the purposes of this study are summarized below:

- A common external tariff of 35% was established for vehicles.[26] In the case of auto parts, a schedule covering the period 2001-2006 was set by each country, establishing the tariff scale to be applied to different types of products.

Intra-regional trade of vehicles was duty-free provided that:

- products complied with the rules of origin requirements;
- it was maintained within the margins established by the ‘export deviation coefficient’ (the so-called ‘flex’ index). The ‘flex’ index was a ratio between the value of exports and imports that could not be exceeded by any of the signing countries.[27]

In 2008, a new agreement was signed valid until June 2014.[28] It was agreed, however, that provisions regarding intra-regional trade had validity until June 2013. Through this clause the Argentinean government intended to correct a disadvantage implicit in the existence of a symmetric flex index for two markets with big differences in size. The two governments finally

decided to establish differentiated flex indices depending on which country had a deficit in the bilateral trade balance.

2.2 The Evolution of the Automotive Industry in Argentina and Brazil since the Creation of MERCOSUR

The expansion of the MERCOSUR automotive space was framed by both the global reorganization undergone by the automotive production network depicted in the previous section and the regulatory scheme briefly described above. Three interrelated trends which developed in this region are here worth stressing.

Firstly, there was a significant expansion of the number of vehicles produced and commercialized in Argentina and Brazil. The first wave of growth took place during the period 1990-1998, when a new automotive policy was put in place in the two countries. During those years, carmakers carried out significant investment to modernize and expand their production capacity. The second and more intense period of expansion initiated in 2003, when Argentina and Brazil started a process of accelerated economic growth after some years of extremely negative economic performance, particularly so for the former country. Considering the whole period, the joint production and commercialization of vehicles grew from 880 thousands units in 1990 to almost 4 million in 2011.[29]

The number of carmakers with manufacturing facilities in the two countries also expanded significantly during this period. In the case of Argentina, some companies which, in previous years, had left local business groups in control of their operations –such as Fiat, PSA Peugeot Citroën, and Renault–, decided in the second half of the 1990s to return to the country and regain direct control over the management of their subsidiaries. This resulted in the complete trans-nationalization of the automotive industry, at the level of car producers. In Brazil, where the car market was almost totally controlled by the group of the so-called Big 4 companies (Fiat, Ford, General Motors and Volkswagen), 'newcomer' firms arrived in those countries in 1997 (e.g. Honda, Renault, and Nissan).

The second trend observed in the region corresponds to a narrowing gap with the affluent Triad countries in terms of the quality of the products manufactured locally as well as of the production processes carried out in local plants.[30] During the second half of the 1990s, carmakers started to produce models with a delay of no more than twelve months with respect to the original launch on their home markets. Beyond some minor changes, vehicles produced in the region were the same as those manufactured in other parts of the world.

The third trend observed in the last two decades in MERCOSUR was the progressive regionalization of the automotive production network. A first indication of this trend is given by the evolution of foreign trade figures of Argentina and Brazil. The incentives established in the

national legislation and bilateral automotive agreements fostered an increasing opening up to bilateral foreign trade flows, with the two countries becoming each other's main trade partners.

Whereas in the period 1986-1990, only 18% of Argentinian exports of vehicles were directed to the MERCOSUR market, this figure grew to 86% in 1990-1994; 94% in 1995-1999; 65% in 2000-2004; 66% in 2005-2009; and 81% in 2010-2012. Similarly, although at lower levels, Brazilian exports to MERCOSUR grew from 6% to 36% (91-94), 48% (95-99); 23% (00-04); 39% (05-09); 68% (10-12).

On the import side, non-MERCOSUR countries had a more significant presence, showing the importance of vehicles imported from parent companies and other subsidiaries to complement the regional product offer. However, during the 2000s, it was above 70% in the case of Argentinian imports from MERCOSUR and between 50% and 65% in the case of Brazilian imports from the region.

A second fact indicating the progressive emergence of a MERCOSUR automotive space is the growing number of automotive MNC with subsidiaries operating in the two countries. In 1994, only 3 companies out of a total of 7 companies established in the region had subsidiaries in Argentina and Brazil. In 2010, the figure had grown to 8, out a total of 10 carmakers. Most companies with manufacturing facilities in Argentina and Brazil followed a complete specialization strategy. That is, each subsidiary specialized in the production of certain families of vehicles using the same platform, which then reached the regional market through intra-firm exchanges. The range of products offered in the regional market was complemented with models imported from other subsidiaries –in particular those located in Mexico– or from parent companies.

3. Analytical Framework and Research Design

As discussed in the Introduction, the research problems posed in this article deal with the evolution of the relative position of subsidiaries operating in the MERCOSUR region within the intra-corporate division of labor, and that of the division of labor among the subsidiaries operating within the region themselves.

These two questions will be addressed using the technological capabilities framework originally developed by authors such as Sanjaya Lall, Martin Bell and Keith Pavitt.[31] The authors built a taxonomy consisting in an ascending scale of different types of technological capabilities, ranging from basic routine production capabilities to advanced innovative capabilities. The scale represents different stages in the acquisition of knowledge of increasing complexity, acquisition that allows firms to generate and manage processes of technological change in products, processes, organization, etc. The process of accumulation of capabilities over time is characterized as a process of technological learning. The technological capability framework

draws on the notion of 'revealed capability'[32]: that is, the level of capabilities attained by a given firm's units is inferred from the knowledge required by the actual activities they carry out.

The matrix of technological capabilities developed by Lall, and Bell and Pavitt[33] has been adapted here to address the specificities of the research problem and the technological features of the automotive industry.[34] An eight-level product engineering capability scale for the analysis of the automotive industry has been elaborated building upon the one developed by Consoni and Quadros (see [Insert Table).[35] However, in contrast to that scale, which grouped product engineering capabilities in basic, intermediate and advanced capabilities, the one used here groups capabilities according to their relative position within the intra-firm division of labor: periphery, semi-periphery, and center.

Capabilities of peripheral subsidiaries essentially include operative and basic adaptive engineering activities; that is, those related to manufacturing operations and the localization of auto parts, components and systems. Some minor adaptations of specific parts and restyling of vehicles also correspond to this level. Semi-peripheral units assume more knowledge-intensive responsibilities, including the development of partial and complete derivatives[36] and, at a higher level, the development of platforms for emerging countries. Finally, subsidiaries and parent companies in the center conduct consistent research and development activities on new technologies, for instance, in the field of safety and security, energy and environment, materials; and the development of new platforms for world markets.

[Insert Table 1]

Source: own elaboration.[37]

In order to respond to the complexity of the phenomenon under analysis, characterized by the extremely intricate and dynamic ways in which multi-level institutional structures and actor networks are interconnected, a multiple embedded case study research was designed.[38] Three automotive MNC, with subsidiaries operating simultaneously in Argentina and Brazil, were selected, these being: Italocars, Francocars, and Nipponcars.[39]

The choice of an 'embedded' case study research design can be justified by the process of regionalization of automotive networks discussed above. The technological performance of individual subsidiaries cannot be fully grasped if not examined in the context of the functionally integrated regional networks of production, commercialization and innovation within which they operate. Accordingly,

1. the main unit of analysis of the research design corresponds to the technological strategy and organization of product engineering activities deployed by the company within the MERCOSUR region between 1991 and 2011.
2. At a second level, the sub-units of analysis (embedded cases) are defined as the evolution of technological capabilities in product engineering activities of the subsidiaries established in Argentina and Brazil during the same period of time.

Multiple sources and information collection methods were employed, in order to enable the triangulation of data, including interviews with managers of MNCs[40], internal documents of companies, newspapers[41], and specialized literature.

4. Empirical Findings: Limited Modernization and the Progressive Articulation of a Hierarchical Intra-regional Division of Labor

4.1 The Technological Gap between Central and Peripheral Automotive Spaces

Figure 1 depicts the evolution of the technological strategy followed by the three automotive MNCs examined in this study. The technological strategy is understood here as the degree of innovativeness of the product engineering activities conducted by automotive MNCs in the MERCOSUR region, as measured with the capability scale presented in Table 1. The boxes in the figure signpost specific 'milestones' in the trajectory of the regional technological strategy of each company. As pointed out above, the technological strategy gives an indication of the relative position of subsidiaries operating in MERCOSUR, within the corporate division of labor.

It is clear that Italocars is the company which adopted the most knowledge-intensive strategy in the region. Early in the 1990s, the Brazilian subsidiary was involved as a co-leader of the so-called project 178 (P178), consisting in the development of a family of models sharing the same platform for emerging markets. In the context of this product policy, the Brazilian unit was progressively given product engineering responsibilities of increasing complexity. By the end of the period under analysis (2011), Italocars developed in the region two new vehicle platforms (P326 and P327) intended to replace models of the P178, thus reaching level 6 of the technological capability scale.

By contrast, the other two companies pursued a conservative and low knowledge-intensive technological strategy, which maintained them at a peripheral position within their own corporations. Nipponcars remained at a level 2 of technological capabilities for the whole period under analysis.

Francocars had a similar strategy until 2007, when it put in place an ambitious decentralization plan of its engineering activities with the creation of a global engineering network –the so-called Francocars Technologies. In the MERCOSUR region, the outcomes of this change of strategy only became apparent in 2011, when the two subsidiaries of Francocars in the region launched new products on the market for which they were given some product engineering responsibilities. The responsibilities delegated to the MERCOSUR engineering center were especially related to the development of flex-fuel engines for the Brazilian market, and the adaptation of the external design of vehicles.

[Insert Figure 1]

Building upon the classification of automotive spaces proposed by Humphrey *et al.*[42] discussed in Section 1 and the technological capability scale (Table 1), it is possible to identify the configuration of two different forms of regional integration schemes within MERCOSUR. The first one, corresponding to the cases of Francocars and Nipponcars, resembles the structure of a "peripheral regional integration". In brief, subsidiaries in the region progressively gave shape to a functionally integrated network around the MERCOSUR area which assumed nationalization responsibilities with low knowledge-intensity to do with the "nationalization" of models. Parent companies and other subsidiaries outside the region were responsible for managing the operations of the MERCOSUR network and for conducting more advanced product development activities.[43]

The case of Italocars offers a different and original scheme, which was not included in Humphrey *et al.*'s classification: that of a "semi-peripheral regional integration". In 2003, Italocars established a development center in the MERCOSUR region –specifically in Brazil– which was given some product development mandates for products targeting emerging regions. As a result, the MERCOSUR region assumed a 'semi-peripheral' status within the corporate division of labor, thus partially bridging the technological gap with most advanced units of the corporation.

Beyond the differences existing across the three companies, in all cases most knowledge-intensive activities remained under the responsibility of units located in central Triad countries – principally, in parent companies. Corporate engineering departments in home-countries maintained an exclusive control over the bulk of R&D activities, as well as over the development of products for more affluent markets incorporating leading edge innovative technologies (levels 7 and 8 in [Insert Table).

4.2 An Increasingly Hierarchical Division of Labor among Subsidiaries in the MERCOSUR Automotive Space

The second question of concern to this chapter deals with the division of labor among individual subsidiaries operating within the MERCOSUR automotive space. The examination of the technological trajectory of subsidiaries operating in member countries shows that, contrary to original expectations, the three companies examined in this study organized their regional production networks in MERCOSUR in a hierarchical manner. Although it was with different levels of verticality, Brazilian subsidiaries were given more knowledge-intensive mandates and more managing responsibilities over their Argentinian counterparts, and, in some cases, were able to accumulate more technological capabilities.

The divergent technological trajectory and hierarchical division of labor between subsidiaries in Argentina and Brazil is particularly clear in the case of Italocars. From the very establishment of Italocars to Argentina in 1995, the company organized a functionally integrated production network around the emerging MERCOSUR space.[44] At that time already, the division of labor

between the two units was very hierarchical, since engineering managers in Argentina (as well as from other areas) reported to their Brazilian counterparts. However, as the Brazilian unit back then did not have advanced product engineering responsibilities, the extent of the technological gap was not that considerable. As its role within the P178 became more important, the Brazilian subsidiary was able to initiate a steady process of accumulation of product engineering capabilities.

The technological gap and the hierarchical relationships between the two units widened progressively over the years. As depicted in Figure 2, the more knowledge-intensive the technological strategy adopted by the company in the region, the more pronounced the hierarchical nature of the intra-regional division of labor. As a result, whereas in 2010 and 2011 the Brazilian subsidiary launched onto the market vehicles using new platforms completely developed by the local Product Development Centre –the P326 and P327– (level 6), the Argentinian subsidiary maintained its basic nationalization responsibilities (level 2). By contrast, although born under the same global project, the Argentinian unit was from the beginning conceived simply as a kind of 'assembly' unit.

[Insert Figure 2]

Existing hierarchies between the two subsidiaries of Italocars also crystallized in the organization of product engineering activities within the MERCOSUR region (Figure 3). All product development responsibilities in MERCOSUR member countries were under the exclusive responsibility of the Brazilian subsidiary. This included not only the control over product engineering functions but also the management of platforms produced in the region. The hierarchical verticality was reflected in turn in the great difference in size of the product development department (Table 2).[45] Whilst the Brazilian unit had 1000 members in 2012, the Argentinian only had 18.

[Insert Figure 3]

[Insert Table 2

Source: own elaboration on the basis of fieldwork.[46]

The experience of Francocars and Nipponcars differed from that of the Italian company. As seen in Figure 4 and Figure 6, in those two cases, the capability scale proved not to be sufficiently adequate to grasp the existing hierarchies within the MERCOSUR region. According to this tool, the two subsidiaries in the region performed activities corresponding respectively, to the level 3

and level 2 of the capability scale. However, existing hierarchies clearly manifested themselves in the distribution of responsibilities within regional product engineering departments.

[Insert Figure 4]

Francocars organized its activities around the MERCOSUR area as early as it established itself in Brazil, so in 1999. However, in contract with Italocars, it maintained a low technological profile until 2007, the year a regional engineering center was created in MERCOSUR –Francocars Technologies Americas (FTA). The purpose of this center, created in the context of a profound decentralization of the corporate engineering strategy (Francocars Technologies), was to delocalize some nationalization and intermediate product development functions to subsidiaries in emerging countries.

The distinguishing feature of the FTA is the fact that, differently from Italocars, it is not based on a single country, but organized on the basis of a regional structure.[47] This includes the fact that the Brazilian and Argentinian subsidiaries have staff members working in all the product engineering areas, each of which is under the responsibility of a regional manager. The distribution of regional managing responsibilities between subsidiaries is decided on the basis of the relative allocation of resources and capabilities. The allocation of management duties of vehicle platforms corresponds to the manufacturing responsibilities of each subsidiary.

As can be seen in Figure 5, the internal division of labor within the FTA clearly favors the Brazilian unit. With the exception of the area to do with chassis equipment and systems, the rest of the areas of the product engineering department, including the overall management of the FTA, are under t Brazilian responsibility of. Moreover, the Brazilian unit is in charge of the areas to do with the engineering of mechanics and of the vehicle's external body, areas for which the FTA was given a degree of autonomy from the corporate engineering department.

[Insert Figure 5]

The unbalanced allocation of responsibilities within the FTA is reflected in the distribution of human resources within the engineering center. In 1999, when Francocars established themselves in Brazil and adopted a low-knowledge intensive technological strategy (Figure 1 and Figure 4), the number of staff members in product engineering functions was very low in both countries: around 35 in Argentina[48] and 30 in Brazil.[49] From the creation of the FTA, the size of the engineering department grew substantially in the two subsidiaries. Growth was much higher in the Brazilian unit. According to data provided by the company, out of the 844 members the FTA counted in 2012, around 60% worked in Brazil, 30% in Argentina and 10% in Colombia.

In the case of Nipponcars, the divergence between the product engineering responsibilities of the two subsidiaries is less evident and more recent.[50] It took place within activities characterized by

a lower level in knowledge intensity, which could not be captured in the technological capabilities scale (in Figure 6 the two subsidiaries remained at level 2).[51]

[Insert Figure 6]

Hierarchies, however, become clearer when the organization of the product engineering department of Nipponcars-MERCOSUR is examined (Figure 7). Although the two subsidiaries have staff members working in technical areas, the regional management office is located in Brazil. The size of the product engineering area in the subsidiaries of Nipponcars is very small, reflecting the low knowledge-intensity of the technological strategy pursued by the company in MERCOSUR. In 2012, the company reported that the number of staff members in product engineering areas was 75 in Brazil and 31 in Argentina.[52]

[Insert Figure 7]

The three cases examined in this chapter present a variety of situations, both in terms of the technological intensity of the regional strategies adopted by MNCs as well as of the type of division of labor adopted between subsidiaries in Argentina and Brazil. Although research based in a case study design do not allow for generalizations, one can tentatively posit the existence of a positive causal relation between the knowledge-intensity of the technological strategy and the verticality of the intra-regional division of labor: as the technological strategy became more intensive in knowledge, the technological divergence between the Brazilian and Argentinian subsidiaries widened.

5. Externally-driven technological trajectories

When analyzing the driving forces guiding the technological trajectory of the three automotive MNCs in the MERCOSUR region, it emerged clearly that it was centrally controlled by parent companies. Subsidiaries examined in this study proved not to have the autonomy to devise their own technological learning strategies –the experience of Italocars from the second half of the 2000s being in this regard the only exception, as further discussed below.

In the first place, the ability of parent companies to control the technological strategy pursued in the MERCOSUR automotive space was based on their exclusive control over critical dimensions of the corporate strategy. A crucial factor determining the scope for technological upgrading in subsidiaries in emerging regions was the type of product policy adopted by the corporation.

In line with what was discussed above in section 1.3, ‘world vehicle’ policies favored the centralization of product development responsibilities in corporate engineering departments. As models manufactured and commercialized across different markets do not require major

alterations, engineering departments in subsidiaries only focus on localization and process engineering activities.

The three companies examined in this study provide clear evidence of this. Beyond differences in scope and characteristics, it appears that upgrading of technological strategies originated in the changes to product policy decided by parent companies (see Figure 1). Italocars was the first company which moved in this direction with the ambitious P178 initiated in the mid-1990s. It took an additional decade for Francocars and Nipponcars to redefine their positions with the Logan project and the Innovative International Multi-purpose Vehicle project (IMV), respectively. Until then, corporate engineering structures were extremely concentrated in the home countries.

The second corporate dimension which proved to be decisive in determining the technological intensity of activities overseas was the level of centralization of product engineering activities. This issue, which is clearly related to the type of product policy, was also under the total control of parent companies. Parent companies had the power to make decisions about the geographical allocation of new product development centers. They were also responsible for funding investment to build the infrastructure necessary for subsidiaries to assume new engineering responsibilities.

Italocars opted for an ambitious decentralization plan in favor of its Brazilian subsidiary concurrently s with the implementation of the P178. The clearest manifestation of this decision was the inauguration in 2003 of a fully-fledged product development center in this subsidiary. By contrast, Nipponcars decided to retain the most complex development activities in its home country, partially delegating some product development responsibilities to its unit in Thailand, under its IMV project. Francocars followed an intermediate course of action, creating a global engineering network which included engineering departments within subsidiaries in different locations.

The choice of a particular geographical location for the decentralization of engineering activities was closely related to the strategic importance of the host location for the expansion of business activities beyond the traditional Triad markets. However, in order for them to be given new responsibilities, subsidiaries were required to have previously started to accumulate some engineering capabilities. In the case of Italocars, it was clear that the Brazilian subsidiary was the preferred choice as it met the two conditions: whilst the MERCOSUR region was the company's largest overseas market, there also had been a history of technical collaboration between the Brazilian subsidiary and the parent company. Similar reasons led Nipponcars to opt for Thailand as its selected location for decentralizing product development activities. Francocars only decided to advance with the empowerment of the Romanian unit once the Logan project succeeded in Central and Eastern Europe.

In sum, the decentralization of intermediate knowledge-intensive activities was essentially a top-down process fundamentally controlled by parent companies. But for the exception of Italocars from the mid-2000s on, subsidiaries, had little room to upgrade their relative position within the corporate division of labor through autonomous in-house technological efforts.

The creation of the product development center was the milestone marking the transition from a parent-driven learning process to one propelled by the subsidiary itself. . It provided the subsidiary with the resources to undertake an in-house process of capability accumulation. A second factor allowing the subsidiary to gain autonomy from the parent company was the delegation of management and engineering responsibilities to the Brazilian unit over other subsidiaries in the Latin American region.

Interestingly, the experience of Italocars shows that it is possible to conceive of the existence of a "capability threshold" from which peripheral subsidiaries are able to undergo a 'creative transition' from low to more advance technological capabilities, with a higher level of autonomy. However, it is worth stressing that even in the experience of Italocars, conditions for the Brazilian subsidiary to be able to attain such threshold and to drive its own technological trajectory were generated by external decisions made by the parent company.[53] When the Brazilian unit had low levels of capabilities it lacked the power and resources to pursue autonomously such an upgrade path.

The second dimension of analysis regards the division of labor between subsidiaries operating in the MERCOSUR automotive space. As seen above, the three companies examined here organized their regional production networks in MERCOSUR in a hierarchical manner, concentrating the more knowledge-intensive functions in one single location.[54]

The factors shaping the division of labor among subsidiaries operating within the MERCOSUR automotive space were, in essence, also under the control of parent companies: i.e. the allocation of management and engineering responsibilities within the region, the allocation of manufacturing responsibilities among subsidiaries (i.e. the regional product policy), funding decisions on investment in infrastructure. Subsidiaries had little room to devise their own technological strategies or to pursue independent in-house technological efforts in these areas.

This shows the preference of MNCs for organizing their activities according to a network rationale, avoiding the overlapping and duplication of functions. This is particularly evident in the field of product engineering activities, which does not require a geographical proximity to suppliers and manufacturing locations. As parent companies decide to adopt a more advanced technological strategy in a certain region, they allocate investment and managing responsibilities to a specific location from which regional operations are then controlled.

6. A Limited Notion of Modernization Informing the Automotive Regulatory Framework

The previous sections shed light on the role of market agents –i.e. MNCs– in giving shape to peripheral (or semi-peripheral) regional automotive networks that are hierarchically organized. When examining the role of state agents as regulators of such regional space it becomes clear that no significant efforts were directed to improving these two features of the MERCOSUR automotive space.

The successive automotive policies and bilateral agreements put in place by the two governments from the early 1990s aimed mainly to enlarge the regional production capacity, and to foster a closer integration of local subsidiaries into regional and global production networks. As far as the promotion of a local technological learning process is concerned, the two governments seemed to have implicitly embraced a rather limited notion of modernization. Policies were primarily focused on the assimilation of management and of best practices in manufacturing, transferred from parent companies, on the use of technology embodied in imported tools and capital goods, and on the production of new models.

Be it at the national or bilateral level, no relevant public policies or provisions were put in place to turn subsidiaries into driving agents of endogenous technological change. No active intervention was carried out for 'embedding' innovation activities with higher modernization potential to be "embedded" in the MERCOSUR region.

The automotive regulatory framework adopted in MERCOSUR embraced a notion of 'obligated embeddedness', to use the expression used by Dicken and Liu[55], restricted to the manufacturing sphere. That is, in exchange for having access to the regional market under the beneficial terms established in the automotive agreement, companies were 'obligated' to integrate a certain level of domestic or regional parts. No provision was included in the agreement regarding the performance of innovation activities, which was not the case in some other countries.[56]

Public policy did not only prove ineffective to bridge the technological gap with more advanced technological centers. Evidence also suggests that the actions of public agents contributed equal to the consolidation of the hierarchical division of labor between Brazilian and Argentinian subsidiaries. Disparities in national and sub-nationals regulatory frameworks seem to have contributed to accentuating existing structural imbalances between the two countries.[57]

Whereas provisions included in bilateral agreements mainly looked after trade imbalances (quotas, compensated exchange, flex rule), other type of disequilibria remained uncovered by the automotive policy. Whilst Brazil was the country with the largest national market in MERCOSUR and, therefore, the one with better structural conditions to attract investment from carmakers with market-seeking strategies, it was also the country where support measures for carmakers were more generously applied.

At the sub-national level, this support was clearly manifest in the so-called "fiscal war" among Brazilian states[58]; at federal level, it was the Brazilian Development Bank which most actively operated to foster the development of the Brazilian automotive industry. In particular, from the second half of the 2000s, the Bank explicitly incorporated the promotion of innovation activities as one of its priorities. This essentially meant that more credit was provided for loans requested to introduce changes in products or production processes.[59]

Disparities in regulatory and incentive programs were clearly inconsistent with the principle of 'balance' on which the integration process was supposed to be based. As opposed to the European Union, MERCOSUR did not put into place a regional competition policy to limit national incentives. Nor did it establish well-endowed structural and cohesion funds aimed at narrowing the development disparities among member states. There was not either any industrial policy at the regional level, funded by a regional budget –which is not even the European Union managed to put in place.

7. Conclusions

As discussed in the Introduction, subsidiaries of MNCs were expected to play a key role in the MERCOSUR region as "carriers of modernization". The crucial assumption was that subsidiaries, because of their two-sided nature, would act as a bridge between the modern developed world and the technologically backward South American region.

The empirical evidence presented in this chapter highlights the fact that the technological behavior of subsidiaries fell well short of the original expectations. The in-depth case studies contributed to show that learning mechanisms are to a large extent controlled exclusively by the parent company. In other words the upgrading of a subsidiary's technological capability is highly dependent on factors external to it.

As clearly shown by the successful experience of some Asian countries , the 'endogenization' of the process of technological change in peripheral economies –if such a neologism can be used – requires the use of a diversity of active public policies –or to put it more simply, what is now known as a 'developmental state'.[60] This endogenization process was achieved by insulating local economies from the international markets. The expansion of MNCs and international trade, was on the contrary used as a channel to build local capabilities, and then export them to the rest of the world. This was the central feature of successful growth experiences in some countries.

This was not the case of Latin America. Here, economic reforms did not manage to promote and endogenous process of technological modernization. In the case of the automotive sector, successful experiences of technological learning in subsidiaries in MERCOSUR were, as seen above, the consequence of external market-driven decisions made by private agents autonomously in their attempt to improve their profitability.

The second observation worth stressing concerns the structural nature of intra-firm hierarchies in MNCs: the technological gap between central, semi-peripheral and peripheral units seems to be a structural feature of MNCs. In the previous decade, the upgrading, of some selected peripheral subsidiaries to a semi-peripheral status should not be interpreted as a result of a "catching-up" process, resulting from the autonomous implementation of in-house technological learning mechanisms in subsidiaries. Rather, it must be seen as a kind of "evolutionary mutation" carried out by parent companies with the purpose of maintaining the profitability of the corporation at the global level. Semi-peripheral subsidiaries proved better prepared than parent companies to provide faster, more effective and cheaper responses to the particular necessities of the emerging markets, which were to be these companies' new source of profit. It is clear that parent companies in the automotive sector maintained a strong preference for keeping strategic R&D and more advanced product development activities under their exclusive control.

As shown by case studies, the MERCOSUR automotive space ended up reproducing, the structural center-periphery scheme prevailing between parent companies and subsidiaries in central and peripheral countries. Within the MERCOSUR's regulatory framework companies gave shape to functionally-integrated hierarchical networks which were centrally controlled by parent companies. The hierarchical character of the network resulted from the asymmetrical redistribution of value chains activities within the region. This led to the concentration of more knowledge-intensive functions in one single location, in order to avoid inefficient overlapping or any duplication of functions.

This study sheds light on an apparent paradox which undermines the very foundations and goals of the regional integration process: as business operations of MNCs become more functionally integrated and technologically advanced within the region, the division of labor among subsidiaries operating in the region becomes more hierarchical. Through its very accomplishment, the goal of integration creates network structures that produce unequal development among the region's economies.

Figure 1- Technological strategy of Italocars, Francocars and Nipponcars in MERCOSUR

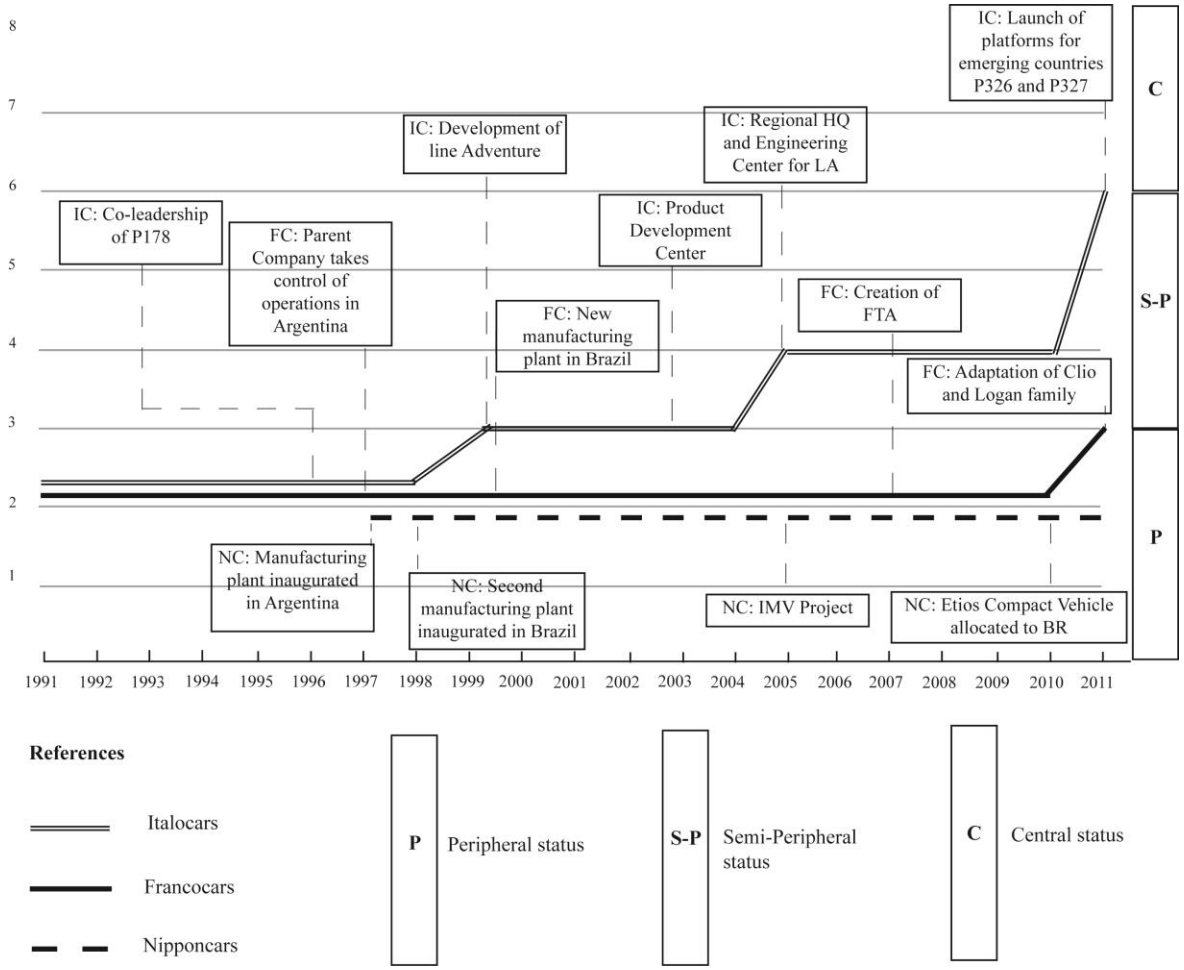


Figure 2 - Process of accumulation of capabilities of Italocars' subsidiaries in Argentina and Brazil

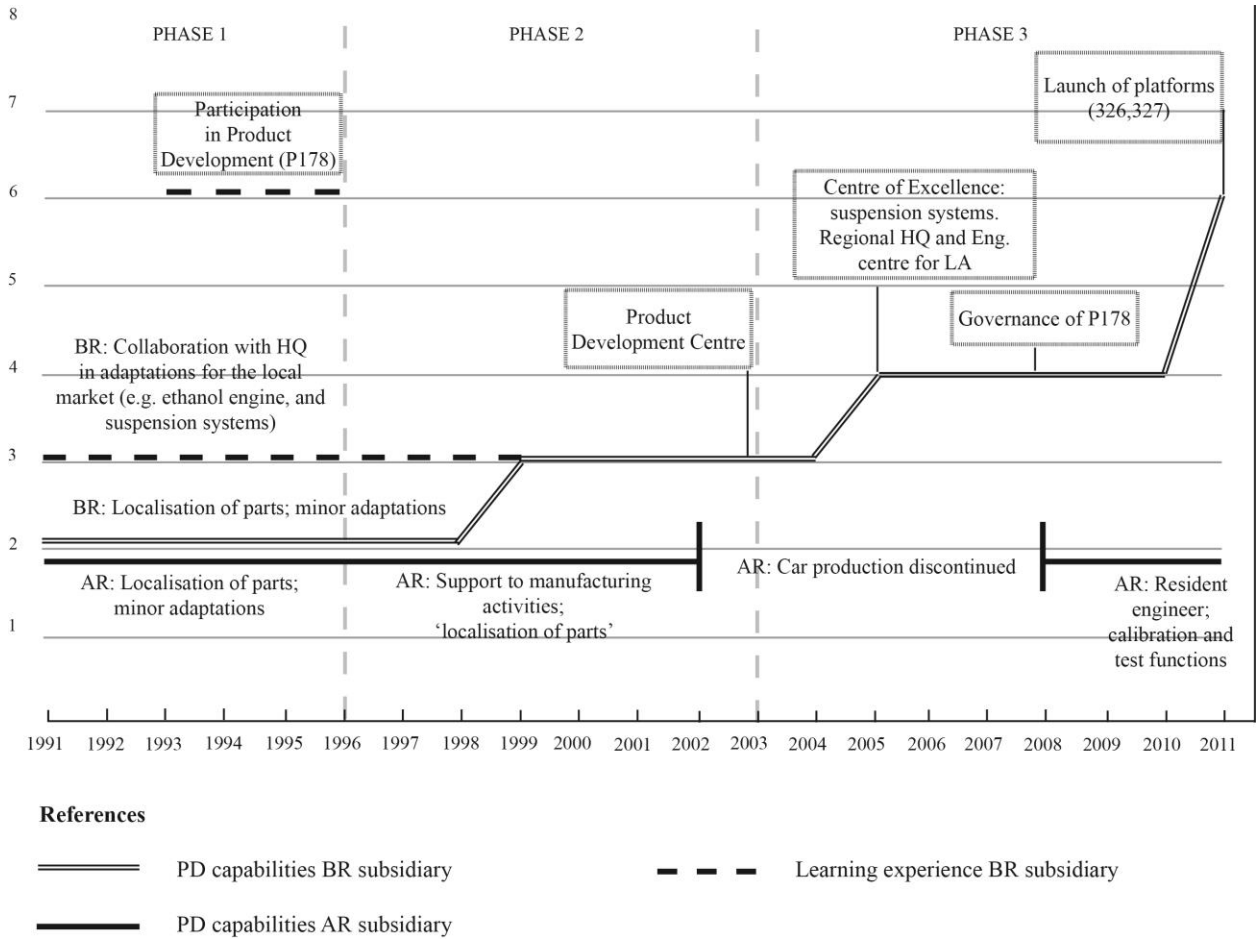
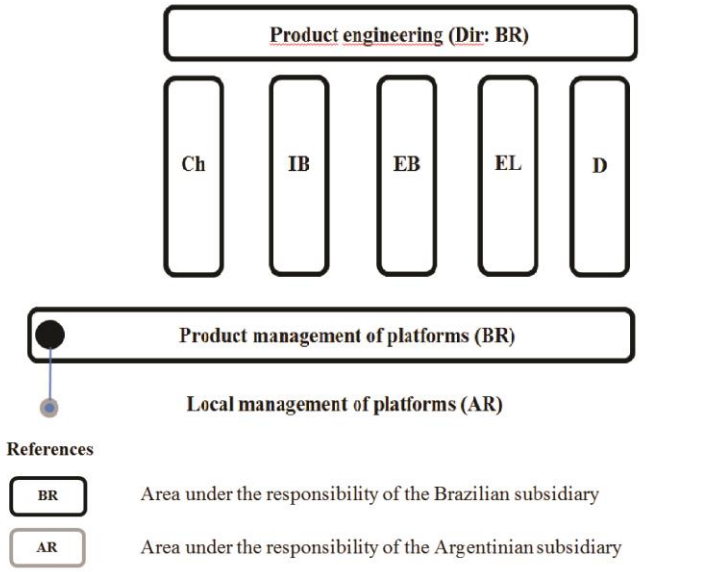


Figure 3 - Organization of Italocars' product engineering department in the MERCOSUR area (2012)



Ch: chassis; IB: Internal body; EB: External body; EL: Electric and electronic systems; D: Design centre

Figure 4 - Process of accumulation of capabilities of Francocars' subsidiaries in Argentina and Brazil

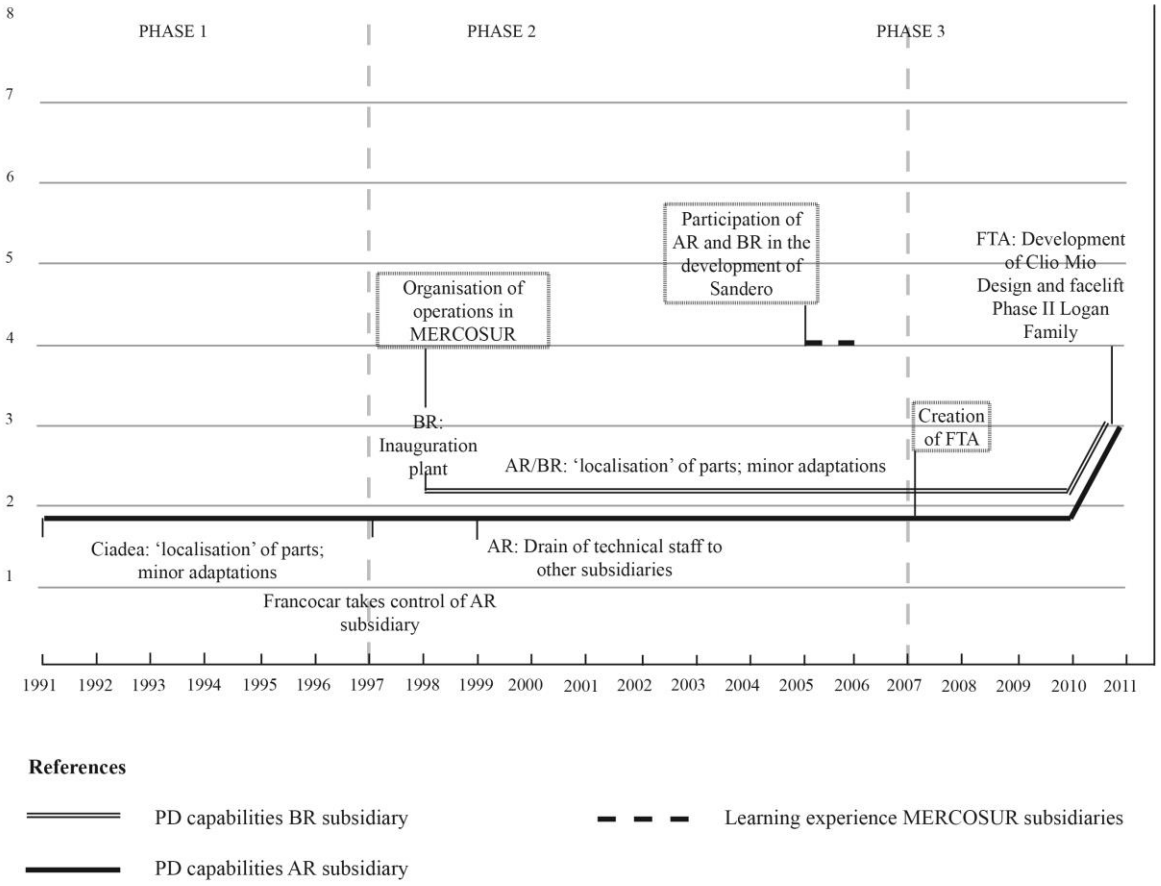
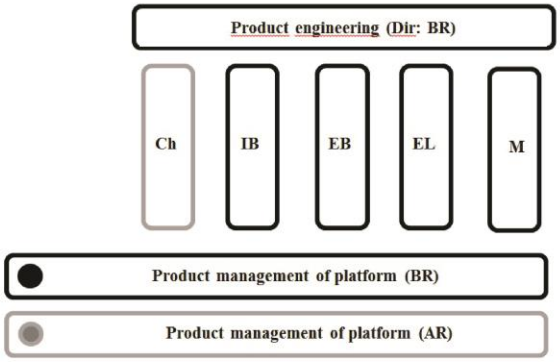


Figure 5 - Organization of Francocars product engineering department in the MERCOSUR area (2012)



References

BR	Area under the responsibility of the Brazilian subsidiary
AR	Area under the responsibility of the Argentinian subsidiary

Ch: chassis; IB: Internal body; EB: External body; EL: Electric and electronic systems; M: Mechanics engineering

Figure 6 - Process of accumulation of capabilities of Nipponcars' subsidiaries in Argentina and Brazil

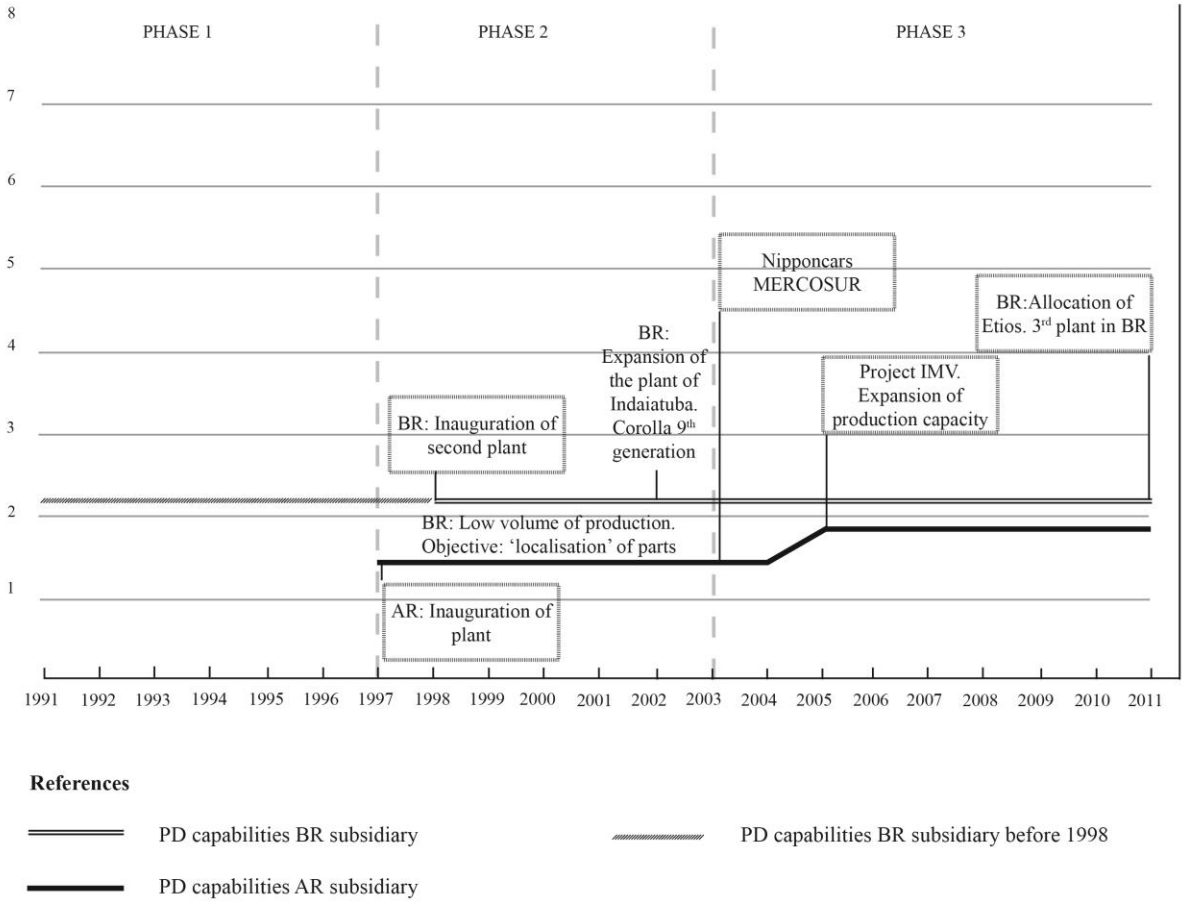


Figure 7 - Organization of product engineering departments of Nipponcars in the MERCOSUR area (2012)

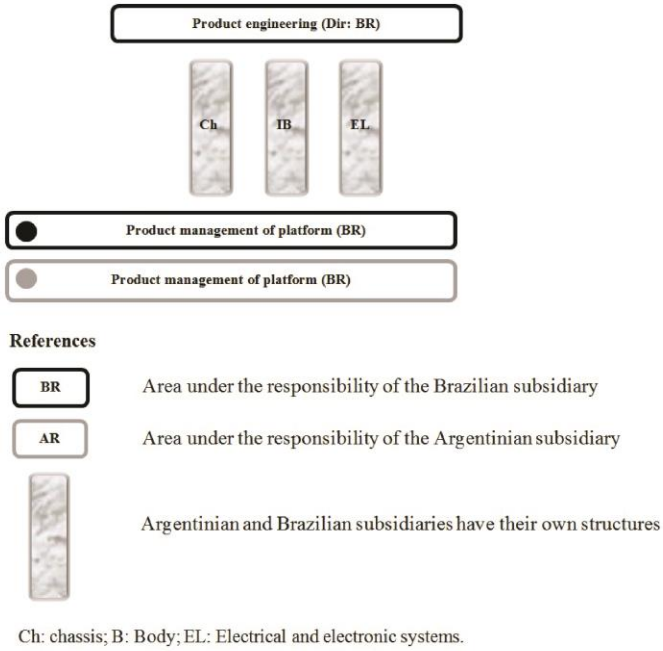


Table 1
Product engineering capabilities in automotive MNCs

PERIPHERY	1. *CKD assembly operations:* - Replication of fixed product specifications. - Standard quality controls.
	2. *Nationalization:* - Localization of parts: search, evaluation, selection and contracting of local suppliers of parts and components. Technical support to local suppliers. - Minor changes in parts and/or components, for instance, in response to local availability of materials or regulations.
	3. *Adaptation/restyling/facelift:* - Adaptations in parts/components to comply with domestic market features and conditions (e.g. suspension, engines). - Restyling/facelifts involving external body and minor adjustment in platforms.
SEMI – PERIPHERY	4. *Development of partial derivatives from existing platforms for regional/emerging markets: Centre of excellence on certain systems/components for the whole corporation*
	5. *Complete derivative projects from existing platforms for regional/emerging markets*
	6. *New platform and family of vehicles for regional/emerging markets*
CENTRE	7. *New platform and family of vehicles for world markets*
	8. *Consistent R&D activities for the development of new products, technology and/or materials using leading-edge technology (engine, driving, braking, suspension, body, electronics, materials)*

Source: own elaboration

Table 1
Number of staff members of product engineering departments

	Italocars			Francocars		Nipponcars	
	1991-1996	1997-2002	2003-2011	1997-2006[i]	2007-2011	1997-2002	2003-2011
Argentina	n.d.	n.d.	18	35 (1999)	250	n.d.	31
Brazil	200 (1996)	350 (1999)[ii]	1000	30 (1999)	500	n.d.	75

Source: own elaboration on the basis of fieldwork.

[1] See, for instance, ECLAC, *Open regionalism in Latin America and the Caribbean. Economic integration as a contribution to changing production patterns with social equity* (Santiago de Chile: United Nations publication, 1994); IADB, "Beyond the Borders. The New Regionalism in Latin America," (2002).
[2] For an analysis of the political process for the implementation of structural reforms in various Latin American countries, see Juan Carlos Torre, *El proceso político de las reformas económicas en América Latina* (Buenos Aires: Paidós, 1998).. On the Washington Consensus, see John Williamson, "What Washington means by policy reform," in *Latin American adjustment: how much has happened?*, ed. John Williamson (Washington, D.C: Institute for International Economics, 1990).
[3] See Jorge Katz, ed. *Estabilización macroeconómica, reforma estructural y comportamiento industrial. Estructura y funcionamiento del sector manufacturero latinoamericano en los años 90* (Buenos Aires: CEPAL/IDRC-Alianza Editorial, 1996).
[4] See Dani Rodrik, *The globalization paradox: democracy and the future of the world economy* (New York: W. W. Norton & Co, 2011).
[5] ECLAC, *Open regionalism in Latin America and the Caribbean. Economic integration as a contribution to changing production patterns with social equity*; IADB, "Beyond the Borders. The New Regionalism in Latin America".
[6] Spanish acronym for Southern Common Market.
[7] This chapter summarizes the findings of my PhD thesis, Martín Obaya, "Technological trajectories in peripheral integration processes. The case of multinational companies in the MERCOSUR automotive space" (Monash University, 2014). I gratefully acknowledge the University and the Australian government for their financial support without which the present article could not have been written.
[8] In Latin America, these issues have been studied in particular within the sphere of the Economic Commission for Latin American and the Caribbean and the so-called Latin American structuralist school. For a review of this intellectual framework and how it approached the issues pointed out above, see Ricardo Bielschowsky, "Sixty years of ECLAC: structuralism and neo-structuralism," *CEPAL review*, no. 97 (2009); Ricardo Bielschowsky, "Evolución de las ideas de la CEPAL," *Revista de la CEPAL* Nro. Extraordinario(1998); Octavio Rodríguez, *El estructuralismo latinoamericano* (México D.F.: CEPAL-Siglo XXI Editores, 2006).
[9] Timothy J. Sturgeon et al., "Globalisation of the automotive industry: main features and trends," *International Journal of Technological Learning, Innovation and Development* 2, no. 1 (2009); Peter Dicken, *Global shift*, 6th Edition ed. (New York and London: The Guilford Press, 2011); Bernard Jullien and Yannick Lung, *Industrie automobile. La croisée des chemins* (Paris: La documentation française, 2011).
[10] The term Triad regions is used to make reference to countries with high levels of per capita income in Western Europe, North America and Japan. The statistical data used in this study covers the following countries: Belgium, France, Germany, Italy, Spain, United Kingdom, Netherlands, Sweden, Austria, Canada, USA, and Japan.
[11] Source of information: *Organisation Internationale des Constructeurs d'Automobiles* (OICA).
[12] In the first half of the 1990s, between 1.3 (US) and 2.3 (Belgium). In the second half of the 2000s, 1.2 (US) and 1.9 (Sweden). Source of information: Associação Nacional dos Fabricantes de Veículos Automotores, Brazil (ANFAVEA).
[13] Dicken, *Global shift*..
[14] Jullien and Lung, *Industrie automobile. La croisée des chemins*.
[15] Sturgeon et al., "Globalisation of the automotive industry: main features and trends."; Bruno Jetin, "Strategies of internationalisation of automobile firms in the new century: a new leap forward?," in *The second automobile revolution. Trajectories of the world carmakers in the 21st century*, ed. Michel Freyssenet (Basingstoke: Palgrave Macmillan, 2009). Bernard Jullien and Tommaso Pardi, "Structuring new automotive industries, restructuring old

automotive industries and the new geopolitics of the global automotive sector," *International Journal of Automotive Technology and Management* 13, no. 2 (2013).

[16] Jullien and Lung, *Industrie automobile. La croisée des chemins*; Jorge Carrillo, Yannick Lung, and Rob van Tulder, eds., *Cars, carriers of regionalism?* (Hampshire: Palgrave MacMillan, 2004); Sturgeon et al., "Globalisation of the automotive industry: main features and trends."

[17] As a matter of fact, car assemblers exerted great pressure on governments to put in place regulations to increase commercial exchanges. See Dicken, *Global shift*; Rob Van Tulder and Denis Audet, "The faster lane of regionalism," in *Cars, carriers of regionalism?*, ed. Jorge Carrillo, Yannick Lung, and Rob van Tulder (Hampshire: Palgrave MacMillan, 2004).

[18] John Humphrey, Yveline Lecler, and Mario Sergio Salerno, *Global strategies and local realities: the auto industry in emerging markets* (London and New York: MacMillan Press and St. Martin´s Press, 2000)..

[19] The term platform in the automotive industry makes reference to a set of systems and sub-systems shared by a group of vehicles. Although it varies in each case, it is common that platforms include: the chassis and other structural and mechanical components; front and rear axles as well as the distance between them; steering mechanisms; suspension systems; the placement and choice of engine and other powertrain components.

[20] The diversification of product policies was a result of significant technological innovations developed by automotive companies. Particularly relevant in this regard has been the increasing use of 'shared platforms': i.e. a range of models which use different bodies and are equipped with different features, but share a large number of 'invisible' components (e.g. engine, transmission systems, suspension and exhaust systems, axis). Other important technological innovation implemented by the automotive industry during this period is the 'modularisation' of certain components. That is, the development of 'modules', defined as a "group of components arranged close to each other within a vehicle which constitute a coherent unit. A component system is a group of components located throughout a vehicle that operates together to provide a specific vehicle function" Dicken, *Global shift*.: 340. The diffusion of modular and systems-based architectures favoured an increasing outsourcing of manufacturing activities to external suppliers, which assumed co-design responsibilities with carmakers. As a result of this process, the contribution of suppliers to the total value of the vehicle arose to around 70%-80% Jullien and Lung, *Industrie automobile. La croisée des chemins*; Sturgeon et al., "Globalisation of the automotive industry: main features and trends".

[21] Ruy Quadros, "Brazilian innovation in the global automotive value chain: implications of the organisational decomposition of the innovation process," (2009).

[22] The term 'semi-peripheral' is borrowed from Wallerstein; see Immanuel Wallerstein and Terence K. Hopkins, *World-systems analysis. Theory and methodology*, ed. Immanuel Wallerstein, Explorations in the World Economy: Publications of the Fernand Braudel Center (Beverly Hills - London - New Delhi: Sage Publications, 1982)..

[23] For a more detailed analysis of the evolution of the automotive regulatory framework in Argentina and Brazil, see A. Comin, *De volta para o futuro: política e reestruturação industrial do complexo automobilístico nos anos 90* (São Paulo: Annablume, 1998); Fernanda De Negri et al., "Determinantes da acumulação de conhecimento para innovação tecnológica nos setores industriais no Brasil. Setor Automotivo," (2008); Andrés López et al., eds., *La industria automotriz en el Mercosur* (Montevideo: Red Mercosur de Investigaciones Económicas, 2008). Juan Cantarella, Luis Katz, and Gonzalo de Guzmán, "La industria automotriz argentina: limitantes a la integración local de autocomponentes," (2008); Eduardo Meira Zauli, "Políticas públicas e targeting social - Efeitos da nova política industrial sobre o setor automobilístico brasileiro," *Revista de Economía Política* 20, no. 3 (2000)..

[24] As a matter of fact, under the umbrella of the Programme for Integration and Economic Cooperation (PIEC) launched in 1986, some first steps were taken aiming at achieving closer integration between the Brazilian and Argentinean automotive industries. An agreement regulating bilateral exchanges of vehicles and auto parts was signed in 1988 (*PICE Protocolo Nº21 - 1988*): the two countries established import quotas free of tariffs for vehicles produced on their respective territory.

[25] The automotive sector was excluded from the free trade agreement signed between the two countries *(ACE Nº14 - 1990 (ALADI))* –extended in 1991 to the other two original member countries of MERCOSUR: Paraguay and Uruguay *(ACE Nº 18 – 1991 (ALADI)).*

[26] This norm made reference to different types of vehicles, including trucks, buses, trailers, etc. Here, unless explicitly stated, we will focus on cars and light commercial vehicles.

[27] The protocol set a flex index of 1.105 in 2001. This meant that if, for instance, Argentina exported US$ 1.105 billion to Brazil it had to import at least US$ 1 billion from that country. Differently from the previous scheme, in which export requirements were enforced at the level of the firm, this agreement was monitored at a global level. It

was only in the cases where global bilateral trade went beyond the limits set by the flex index that the foreign trade balance sheets of individual companies were examined. The coefficient changed over the years as a result of successive renegotiations. It changed to 2 in 2002, 2.2 in 2003, 2.4 in 2005, and 2.5 in 2006.

[28] *ACE Nº14 – Protocolo 38 (ALADI).*

[29] The joint participation of the two countries in the world production of vehicles rose substantially, escalating from 2.52% in the period 1990-1994 (10th largest producers) to 5.13% in 2009-2011 (6th largest producers). Source: ADEFA and ANFAVEA.

[30] Although this process started in 1991, when the recovery of the industry began, the modernization of local subsidiaries was only consolidated with the arrival of new carmakers from the second half of the 1990s.

[31] Sanjaya Lall, "Technological capabilities and industrialization," *World Development* 20, no. 2 (1992). and Martin Bell and Keith Pavitt, "The development of technological capabilities," in *Trade, tecnhology and international competitiveness*, ed. Irfan ul-Haque (Washington, D.C.: The World Bank, 1995).

[32] Paulo N. Figueiredo and Klauber Brito, "The role of dual embeddedness in the innovative performance of MNE subsidiaries: evidence from Brazil," *Journal of Management Studies* 48, no. 2 (2011).

[33] Lall, "Technological capabilities and industrialization." and Bell and Pavitt, "The development of technological capabilities."

[34] This study focuses on an analysis of technological activities in the specific field of product engineering activities. Innovation activities in the field of product development activities have become a central aspect of the technological strategies of carmakers, in particular, as the product life cycle of vehicles has shortened and competition intensified at the global level in the last two decades. The bulk of R&D expenditure and strategic challenges and priorities of carmakers are focused on the development of product innovations EUCAR, "Challenges and priorities for automotive R&D," (Brussels: European Council for Automotive R&D, 2011). Focus on product development and engineering activities has been dominant in the examination of the technological learning experiences of Brazilian automotive subsidiaries. See, for instance, Giovanni Balcet and Flávia Consoni, "Global technology and knowledge management: product development in Brazilian car industry," *International Journal of Automotive Technology and Management* 7, no. 2-3 (2007); Flávia Consoni and Ruy Quadros, "From adaptation to complete vehicle design: a case study on product development capabilities of multinational assemblers in Brazil," *International Journal of Technology Management* 36, no. 1-3 (2006); Ruy Quadros and Flávia Consoni, "Innovation capabilities in the Brazilian automobile industry: a study of vehicle assemblers' technological strategies and policy recommendations," *International Journal of Technological Learning, Innovation and Development* 2, no. 1/2 (2009).

[35] Consoni and Quadros, "From adaptation to complete vehicle design: a case study on product development capabilities of multinational assemblers in Brazil."

[36] The development of *partial* derivatives involves the transformation of an existing model into a different version: for instance, a hatchback (Fiat Palio) into sedan (Fiat Siena); or a pick-up truck (Corolla) into a SUV (SW4). *Complete* derivatives are entirely new models developed on existing platforms: e.g. Chevrolet Meriva (General Motors) and Volkswagen Fox.

[37] The technological capability scale is elaborated on the basis of Consoni and Quadros, "From adaptation to complete vehicle design: a case study on product development capabilities of multinational assemblers in Brazil.".

[38] R. K. Yin, *Case study research: design and methods* (London: Sage, 2009).

[39] Written authorisation has been provided by companies and interviewed managers to report the findings of the research project. However, in order to comply with the research ethics standards in of Monash University, companies will not be identified by their names.

[40] Between March and December 2012 a total of 17 interviews were conducted with managers of the selected subsidiaries in Argentina and Brazil. Additionally, 9 interviews were conducted with scholars and executives of business associations in the two countries.

[41] The ISI Emerging Market Database was used to collect information from newspapers; see http://www.securities.com/emis/.

[42] Humphrey, Lecler, and Salerno, *Global strategies and local realities: the auto industry in emerging markets*.

[43] In the case of Francocars, the semi-peripheral unit responsible for the Logan platforms is located in Romania. In the case of Nipponcars, it is based in Thailand.

[44] Between 1980 and 1995, the management of the Italocars brand was in the hands of a local business group (Sevel) in which the parent company had a minority stake.

[45] Although data is not available for the first two periods in Argentina, significant differences can be inferred from the figures presented in the table.

[46] Information from the last period of each company corresponds to the year 2012, when interviews with managers were conducted (see footnote 40).
[47] The FTA encompassed the product engineering departments of the subsidiaries in the Americas region –the three main units being located in Argentina, Brazil and Colombia.
[48] As pointed out by a manager interviewed, in the past, the product engineering department had more than 200 members. This reflects the downsizing of local engineering teams in subsidiaries as a result of their closer integration to global production networks.
[49] Ruy Quadros and Sérgio Queiroz, "The implications of globalisation for the distribution of design competencies in the auto industry in Mercosur" (paper presented at the Actes du Gerpisa N. 32, Paris, 2001).
[50] The differentiation began to take shape when the production of the compact vehicle Etios in Brazil was confirmed by the parent company in 2010. Although maintaining the same technological strategy in the MERCOSUR region based on nationalization activities, Nipponcars started to concentrate product engineering activities of Nipponcars-MERCOSUR in the Brazilian subsidiary.
[51] The presence of the company in the region is rather recent, and the volume of production during the first five years was very low (around 20,000 units in each country).
[52] Source of information: interviews with Nipponcars' managers.
[53] This in in line with finding by Norlela Ariffin and Martin Bell, "Patterns of subsidiary-parent linkages and technological capability-building in electronics TNC subsidiaries in Malaysia," in *Industrial technology development in Malaysia. Industry and firm studies*, ed. K.S. Jomo, Greg Felker, and Rajah Rasiah (London and New York: Routledge, 1999).; and Michael Hobday and Howard Rush, "Upgrading the technological capabilities of foreign transnational subsidiaries in developing countries: the case of electronics in Thailand," *Research Policy* 36(2007).
[54] This is in line with findings by Alan M. Rugman, Alain Verbeke, and Wenlong Yuan, "Re-conceptualizing Bartlett and Ghoshal's classification of national subsidiary roles in the multinational," *Journal of Management Studies* 48, no. 2 (2011).
[55] Weidong Liu and Peter Dicken, "Transnational corporations and "obligated embeddedness": foreign direct investment in China's automobile industry," *Environment and Planning* 38(2006)..
[56] In this regard, the case of China is particularly interesting; see ibid..
[57] As a matter of fact, the lack of effective mechanisms to avoid the deepening of intra-regional imbalances was not exclusive to the automotive framework. It was characteristic of the MERCOSUR process as a whole; see Gustavo Baruj, Bernardo Kosacoff, and Fernando Porta, "National policies and the deepening of MERCOSUR: the impact of competition policies," in *Deepening integration in MERCOSUR. Dealing with disparities*, ed. Juan S. Blyde, Eduardo Fernández Arias, and Paolo Giordano (Washington D.C.: Inter-American Development Bank, 2008)..
[58] See Glauco Arbix, "Guerra fiscal e competição intermunicipal por novos investimentos no setor automotivo brasileiro," *Dados - Revista de Ciências Sociais* 43, no. 1 (2000); Andrés Rodríguez-Pose and Glauco Arbix, "Strategies of waste: bidding wars in the Brazilian automobile sector," *International Journal of Urban and Regional Research* 25, no. 1 (2001).
[59] In 2007, the BNDES created the Programme for Automotive Engineering specifically oriented to the promotion of technological knowledge in the car sector. Until its expiration in 2009, this programme lent R$ 374.5 million. In 2009, with the creation of the programme BNDES Pro-Engineering and the Production Innovation Facility, the bank expanded the coverage of the innovation programme to include other sectors such as that of capital goods, defence, aeronautical, aerospace, nuclear and the supply chain of oil, gas and naval industries. Also in 2009, the Production Innovation Facility was created to increase the absorption capacity of companies from R&D activities. With these programmes, the BNDES sought to improve the capacity of carmakers and suppliers to accumulate technological capabilities, in particular that of first tier suppliers.
[60] See Vivek Chibber, *Locked in place: state-building and late industrialization in India* (Princeton, NJ: Princeton University Press, 2003); Peter Evans, *Embedded autonomy: states and industrial transformation* (Princeton, NJ: Princeton University Press, 1995); Atul Kohli, *State-directed development: political power and industrialization in the global periphery* (New York: Cambridge University Press, 2004).