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Industrial Renewal and Inter-firm Relations in the Supply Chain of the Brazilian Automotive Industry

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Foreword

This document is part of the series on "Small Enterprise Clusters and Global Value Chains" of the SEED Working Papers. IFP/SEED's work in its theme of Market Access is based on the premise that small enterprises can grow and become competitive economic ventures when they have clear and well-developed strategies to target and access quality market opportunities for selling their outputs. An important aspect in the strategic development of these small enterprises is a deeper and more nuanced understanding of the dynamic nature of market access, and furthermore, how this process shapes where market opportunities arise or become restricted. This series of Working Papers aims to examine how small enterprises are embedded in horizontal linkages between firms (through clusters and networks) and vertical linkages with markets (through local and global value chains). This perspective of small enterprise linkages can be a particularly effective approach to overcome many of the traditional constraints facing small enterprises and to help in fostering the development of truly vibrant and economically viable small enterprises that can serve as a sustainable form of quality job creation and income generation for developing countries. In a global economy, the vertical linkages between small enterprises and markets increasingly shape the range of market opportunities available.

The present study in this series presents research findings and analysis regarding the period of rapid restructuring in the Brazilian automotive industry in the late 1990s and up to 2003. It is shown how this restructuring involved deep transformations in the composition of the vehicle assembly and components supplier industries, as well as changes in the relations between them. This restructuring involved large-scale foreign direct investment which, for the assemblers, meant the entry of several vehicle assemblers who were not previously producers in Brazil and the construction of greenfield plants that introduced new production technologies, product designs and innovative forms of management and work organization. For the components producers, in contrast, the entry of foreign direct investment unleashed a trend of concentration, as leading local firms were bought by foreign companies, and in some cases, new multinational subsidiary plants were installed. This new situation, joined with relaxed local content requirements and eased imports, led to a sharp decline of less competitive parts producers, generally family-owned firms. New practices in supply chain management led to the emergence of a clear pyramid where first-tier firms have become increasingly responsible for overseeing the management and coordination of the production, delivery, assembly and final cost of sub-assemblies sold to their automotive clients. At the most extreme end, the modular assembly model of production and supply chain management was tested out for the first time in the world on Brazilian soil, serving as a laboratory for this new experiment in sharing a wider range of roles and responsibilities between assemblers and their core suppliers.

The overall result is a leaner and more productive motor vehicle industry, which manufactures higher-quality and lower-cost vehicles, yet which raises implications about the impacts of this process as regards the scale and conditions of employment.

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List of acronyms and abbreviations

CIPs	Continuous Improvement Programmes
CKD	completely knocked down
FOB	Free on board
GEIA	Grupo Executivo da Industria Automobilistica
GM	General Motors
GMB	General Motors do Brasil
ISI	Import Substitution Industrialization
JIT	Just in time
NUMMI	New United Motor Manufacturing Incorporated
OTIMO	Otimização de tempo, inventários e mão de obra (Optimization of time, inventory and labour)
R & D	Research and development
SPC	Statistical Process Control

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1. Introduction

Enormous changes took place throughout the global automotive industry during the 1990s, as the final assemblers of motor vehicles diffused technological and organizational changes in their production chains. As these new production practices spread to developing-country markets, and in particular throughout the Latin American automotive industry, it is important to understand the implications that this raises for industrial organization, the basis for continued technological development in these countries and the scope for competitive insertion in international and regional markets. One key to mapping the extent of these transformations is to examine changes in inter-firm relations, between the automotive assemblers and their suppliers of components.

It is particularly relevant to examine the Brazilian automotive industry in this context. In the 1990s, market liberalization exposed this formerly protected industry to international competition. The delayed process of liberalization had a double impact on Brazilian producers: exposure to international competition and the need to undertake industrial restructuring which most companies in the industrialized countries had already confronted in the eighties. The pace of change was rapid, involving both the shedding of workers and of auto parts-firms throughout the supply chain. At this stage, the result is a leaner and more productive industry, which manufactures higher-quality and lower-cost vehicles. However, the impact in terms of employment consequences – both the scale of jobs generated by this industry, as well as the terms of employment for some workers – indicate that these transformations have brought mixed outcomes.

Macroeconomic stabilization under the *Plano Real* made Brazil a more attractive investment site and the country enjoyed significant new investments in automotive plants and equipment during the mid-1990s. Despite fears of over-capacity, which was already evident in the industrialized countries, numerous new entrants continued to construct new factories, often with the assistance of generous state incentives; but the conditions that undermined macroeconomic stability in early 1999 forced companies to re-examine their investment plans and the process of expanding output. It is not easy to foresee how the region in general will respond to economic challenges in the wake of globalization.

At the plant level, the diffusion of new manufacturing practices has been significant. Parts firms have continued to introduce organizational changes to increase product quality, price and customer delivery, much as they did at the start of the 1990s. The research findings presented in this document reveal that the modernization process has deepened and has involved new diffusion of technological change, especially in the case of parts firms that have been acquired by multinational producers.

In terms of inter-firm relations, the Brazilian auto parts industry has been transformed almost beyond recognition from its composition and behaviour at the end of the 1980s. The shake-out of parts firms and lowered local content levels have resulted in a few leading first-tier firms, which are affiliated with major multinational components producers. The new standards being introduced by the assemblers are creating a nexus of first-tier firms which are capable of acting as modular suppliers. This model of higher-quality and lower-cost production is being diffused throughout the automotive production chain, but in varying degrees, depending upon the type of product produced.

This report analyzes the transformations in the Brazilian automotive industry and changes in inter-firm relationships by examining three production chains: brake systems; car seats; and exhaust pipes. The findings reveal that all production chains share common trends in terms of closer relationships between assemblers and their first-tier suppliers that produce systems or modules. These tighter inter-firm relations help to diffuse modern

manufacturing practices and quality programmes down the production chain. However, differences were identified between some first-tier firms on the basis of their product type, technological sophistication and relationship with the multinational parent company.

It will be seen that the dual processes of modernization of this industry in Brazil and its insertion in global production systems have involved an upgrading of firm practices, but in a form which has exposed this formerly protected national industry to the vulnerabilities of market fluctuations, as well as the consequences of decisions based upon the global competitive strategies of the multinational parent companies.

The study begins with a brief overview of the Brazilian motor vehicle industry, followed by a brief case study of General Motors do Brasil (GMB) and its supply chain relationships. After this, the study then looks in-depth at:

a) A high-tech manufacturer of braking systems which was, until recently, family-owned and which was able to compete successfully against a multinational subsidiary located in Brazil. A licensing agreement resulted in this firm being bought by a British company, now making it a subsidiary of a multinational.

b) A low-tech exhaust pipe manufacturer which was part of a Brazilian conglomerate until it was bought by an Italian company with the aim of supplying products to both the Brazilian and Argentinian markets.

c) A car seat manufacturer which is a more recently established subsidiary of an American producer and thereby provides an interesting contrast to the first two cases, both in terms of products and production techniques.

Some possible implications for human resource development, training, skill requirements and trade union response are examined.

2. Situating the research findings within the context of global and local transformations

The 1990s saw rapid and profound changes in three major areas of the global automotive industry, which merit mention in order to adequately understand their implications for this industry in Brazil. These three main areas are: transformations in the international automotive industry; changing inter-firm relations in the automotive production chain; and a new industrial organization which has emerged for the Brazilian automotive industry.

2.1 Transformations in the international automotive industry

The automotive industry has become increasingly globalized in its production, distribution and commercialization of vehicles. Whereas the automotive industry has operated increasingly on an international scale for several decades, the term "globalization" refers to the greater depth and integration of activities being conducted in countries and regions around the world. Another significant change has been in the composition of this industry. Motor vehicles assembly has been traditionally concentrated in the hands of no more than two dozen companies responsible for the production of all motor vehicles worldwide. In the 1990s, a wave of mergers and acquisitions in the assembly sector increased the concentration of global production, with 80 per cent of motor vehicles worldwide being produced by ten vehicle assemblers by the end of the 1990s (UNCTAD, 2000).[1] Table 2.1 shows the growing global importance of sales by these recent automotive alliances.

In contrast, the vehicle parts industry has traditionally been a highly fragmented industry, composed of several hundreds of companies of the most diverse size, origin of ownership and degree of technological sophistication imaginable – ranging from backyard production using rudimentary techniques to conglomerates linked with a major vehicle manufacturer (for example, Delphi, the major parts supplier of General Motors). In recent years, both assembly and components industries have undergone a rapid and far-reaching process of mergers and acquisitions, resulting in a much more highly concentrated industry overall. The leaders in the US components industry represent a substantial share of revenues and employment creation in the American motor vehicle industry. The logic behind these radical changes is that the need for effective global operations on the one hand, and the high cost of technological and design innovations on the other hand, have led companies to join together (either through strategic alliances, joint ventures or acquisitions) to achieve economies of scale and scope in their design, production and sales.

[1] Size of the automotive manufacturer has become increasingly important partly to offset the pressures of weakened consumer demand, overcapacity in the industry as a whole and pressures for less polluting vehicles (UNCTAD, 2000). Some analysts posed a striking estimate that a passenger vehicle manufacturer must produce a minimum of four million cars per annum to survive (JETRO, 2000).

Table 2.1: Production and share of global automotive alliances (alliances as of July 2000; production share for 1998)

Alliances/partners	Share of ownership (%)	Share of world production (%)
GM	-	**14.7**
Isuzu	49	0.5
Fiat	20	5.1
Fuji	20	1.0
Suzuki	10	2.5
Ford-Mazda	-	**15.6**
Ford	100	12.7
Volvo Cars	100	0.8
Mazda	33	1.8
Land Rover	100	0.3
Daewoo Alliance	-	**1.5**
Daewoo	100	1.5
Ssangyong	52	0.1
Daimler-Chrysler-Mitubishi	-	**11.1**
DC	100	8.3
Mitsubishi Car	34	2.8
Hyundai Alliance	-	**2.5**
Hyundai	100	1.7
Kia	51	0.7
Asia Motors	16	0.0
Toyota	**100**	**8.6**
Daihatsu	51	1.1
Hino	34	-
Renault	**100**	**4.3**
Nissan	37	5.1
Samsung	70	0.1
VW Group	**100**	**9.4**
Scania	19	-
Other companies not included in list	-	**32.3**
World Total*	-	100.0

Note: *Totals may differ because of rounding.

Source: International Metalworkers' Federation (2000).

2.2 Changing inter-firm relations in the international automotive industry

Vehicle assemblers previously centralized responsibility for all stages in the production process, creating vast corporations where the negotiation of prices, purchasing of the entire range of parts and components, storage, assembly, quality control, shipment and sales of vehicles were conducted in-house. Largely inspired by the Japanese model of production, automotive assemblers now are passing down the responsibility for most of these activities to other companies in their supply chain. Assemblers now focus on core strategic and financial elements such as the design of new models, the location and sourcing of production and the financing and commercialization of finished vehicles. First-tier components suppliers are now becoming vehicle sub-assemblers. In many cases, they are taking responsibility for the negotiation of parts prices, ordering of products, overseeing the management of the production chain and assembly of received parts into sub-assemblies, or modules, which are quality-checked and delivered to the assembler, who conducts the final assembly. Many industry analysts have even suggested that parts production may become more highly concentrated than the assembly industry, with the emergence of a handful of powerful, globally active conglomerates which dominate the production of auto parts worldwide and operate as trusted first-tier suppliers for all the major automotive producers around the globe. Nevertheless, the level of outsourcing by the assemblers varies according to the strategies of each car company, as well as according to some characteristics of the module or sub-assembly. Indeed, it can be noted that, in some cases, the assembler prefers to retain activities such as negotiation of parts prices and choice of second-tier suppliers in-house, as these activities are considered to be strategic.

The new profile of the domestic Brazilian automotive industry is central to the present report. In contrast to the trend of overall consolidation throughout the automotive industry on an international level, the Brazilian automotive industry has undergone a dual-path trend.

On the one hand, the liberalization of the domestic market in Brazil and exposure to global competition has led to sudden changes in the structure of the parts industry: many firms have closed or shifted to other sectors; those remaining have mostly been absorbed in a wave of mergers and acquisitions by multinational companies. As a result, the Brazilian auto parts industry is now composed of a greatly reduced number of firms, which are generally larger in size than before and either wholly-owned subsidiaries of multinational corporations or joint ventures.

On the assembly side, a tendency has emerged in Brazil, which contrasts with the overall trend in the rest of the global automotive industry. The Brazilian assembly sector has expanded rapidly, with a large number of new entrants that have installed in diverse regions of the country, causing a diversification of the geographical structure of the industry as seen in Table 2.2. These new investments in modern plants, equipment and production organization are forcing an overall upgrading of the industry, even among existing firms which could be considered “brownfield” sites from many aspects.

Table 2.2: Output, investments and location of national production of motor vehicles in Brazil, 1997-2003

Company	Output (units)		Investments (millions)	Location
Existing companies	**1997**	**2003**		
Agrale/Navistar	623	4,802	200	Caixas do Sul-Rio Grande do Sul
Fiat	619,166	358,206	240	Betim- Minas Gerais
Ford	230,245	219,234	700	São Bernardo do Campo- São Paulo and Camaçari-Bahia
General Motors	507,386	511,517	600	São Caetano do Sul and São José dos Campos- São Paulo and GravataíRio Grande do Sul (inaugurated in 1999)
Daimler Chrysler	40,477	44,546	820	São Bernardo do Campo-São Paulo and Juiz de Fora-Minas Gerais (inaugurated in 1998)
Scania	9,532	7,973	n.a.	São Bernardo do Campo- São Paulo
Toyota	3,791	40,953	150	Indaiatuba-São Paulo
Volkswagen/Audi	650,972	470,198	1,000	São PauloSP, Resende-Rio de Janeiro (inaugurated in November 1996) and São José dos Pinhais-Paraná (inaugurated in 1999)
Volvo	6,674	6,147	n.a.	Curitiba- Paraná and Pederneiras-São Paulo
New entrants	**1997**	**2003**		
Asia Motors**	-	-	500	Camaçari-Bahia
Chrysler (inaugurated in July 1998)*	-	4,945*	315	Campo Largo-Paraná
Honda (inaugurated in October 1997)	837	33,927	150	Sumaré-São Paulo
Hyundai**	-	-	286	Simões Filho-Bahia
International (inaugurated in 1998)	-	1,048	n.a.	Caxias do Sul – Rio Grande do Sul
Iveco (inaugurated in 2000)	-	2,593	240	Sete Lagoas-Minas Gerais
Kia**	-	-	42	Itu-São Paulo
Land Rover (inaugurated in 1999)	-	810	150	São Bernardo do Campo-São Paulo
Mitsubishi (inaugurated in 1998)	-	11,767	35	Catalão-Goiás
Peugeot/Citroen (inaugurated in 2001)	-	46,686	600	Porto Real-Rio de Janeiro
Renault/Nissan (inaugurated in 1999)	-	66,631	1,000	São José dos Pinhais-Paraná

Notes: n.a. = Data not available. * Output data refers to 2000, as production was discontinued in 2001. ** The announced investments by these companies have been cancelled.

Source: ANFAVEA, 2004; and Calandro, 2000.

3. The Brazilian automotive industry in the 1990s

3.1 Industry structure

The automotive industry has played a strong role as a leader in Brazil's economic development and trends in this sector have generally served as an important indicator of the direction of the national economy. This industry has introduced innovations in production techniques, product technology and design, as well as social innovations in industrial relations. The role of the State and of multinational producers has been a crucial institutional factor in the development of this industry.

In terms of the regulatory regime, the Brazilian State was generally perceived as a strong negotiator, which forced multinational producers in the 1950s to install production facilities in the country and to accept local content requirements (Shapiro, 1994). In the second phase of the 1990s, multinational corporations undertook massive new investments, similar to the past, but with an entirely different industrial structure and operations, as Table 3.1 shows.

The euphoric perspective in 1997 of unrestrained output growth (when Brazil achieved a new output record of more than 2 million vehicles per annum) was halted abruptly in 1998 with a drop in production of over half a million vehicles (it is worth noting that the total unit decline in Brazilian vehicle production between 1997 and 1998 exceeded Argentine vehicle production as a whole). The outlook became one of rising idle capacity (*The Economist*, 9/01/99; and *Autodata*, 1998), with the consequent expectation of a shake-out among locally-installed assemblers. As Table 2.2 shows, due to the poor results of 1998, as compared with 1997, some of the investments announced in the beginning of the 1990s were cancelled, and Chryslers' plant in Campo Largo, which had been inaugurated in 1998, was closed in 2001.

Table 3.1: Structure of the Brazilian automotive industry in its first phase (1950s) and second phase (1990s) of industrialization

Indicator	First phase (1950s)	Second phase (1990s)
Relationship with multinational parent company	Satellite production plants installed, receiving many designs from headquarters, operations defined largely by Brazilian context	Integration into global production strategies and sourcing policies. Activities in this transnational network are highly influenced by the TNC's global strategy
Behaviour of vehicle assemblers	Strong direct foreign investment by a large number of multinational vehicle assemblers entering the country	Strong direct foreign investment by a large number of multinational vehicle assemblers, establishing production plants in new regions of the country
Regulatory regime/role of the State	Clear industrialization policy established by the Brazilian State, involving stiff negotiation capacity with multinational producers	Lack of overall national industrial policy. Policies specifically for the automotive industry are designed to attract new investment to Brazil by offering semi-market protection via import controls and tariff regime. Lack of coordinated national policy leads to decentralized response, fuelling fiscal battles between states and municipalities to offer the most extensive packet of incentives and tax holidays to attract companies
Marketing strategy	Integrated domestic parts production and vehicle assembly for sale on the domestic market	Mix of domestic production and importation of parts and components under Global Sourcing policy Vehicle sales to domestic and regional market
Spatial composition	Concentrated in the industrial belt around São Paulo city	Decentralized production, with new plants being installed in the South, Central-West and Northeast
Markets served	Domestic market (protectionism of an Import Substitution regime)	Domestic and regional (Mercosur) markets
Industrial organization	Highly vertically integrated firms	Extended production chains, of inter-dependent tiers of supply (pyramid production organization), with high degree of product specialization (i.e. focused "core business")
Production technology	Frequently importing used equipment, from plants in Europe and the United States	Upgrading of installed capacity - piecemeal improvements in existing "brownfield" plants; new equipment and advanced methods implanted in greenfield plants
Production organization	Fordist lay-out commonly used at the time In European and American plants	Introducing state-of-the-art plant organization, designed to have delivery of pre-assembled modules directly to the assembly line
Labour organization	Using labour force with generally poor literacy skills, but good manual and technical skills Assembly posts involve single, fragmented tasks. High labour turnover is commonplace Concentration of the industry creates large reservoir of experienced workers	Trend to require primary and sometimes secondary school diploma among new recruits. In some cases, specific technical skills are not required but desirable behavioural skills are essential. Greenfield sites achieve labour retention. Widespread use of teamwork. Greater integration of work into more complete sequences of operations.
Union representation	Strong union organization, achieving significant workers rights, frequently conflictual labour-management relations, some periods of strikes	In brownfield sites – the experience of Sectoral Chambers uses social dialogue to achieve negotiated modernization. In greenfield sites – often hire unorganized workers, or seek relations with trade unions that are non-conflictual
Inter-firm relations	Multi-Sourcing (core assembler makes purchasing decision based upon price-bidding from several suppliers for each part)	Single-sourcing (development of long-term relationship of trust and collaboration with component suppliers) Tiers of supply relations, creating extended production chain Insertion in global production chain

Indicator	First phase (1950s)	Second phase (1990s)
Auto parts sector	A large number of local firms and multinational subsidiaries established Protectionism encouraged a dense network of parts firms and the consolidation of product technology and production techniques. Over time, a competitive segment of exporting firms emerged, with superior price and quality	New entrant parts firms install in Brazil, as well as an intense wave of mergers and acquisitions by multinational corporations. Integration of the Brazilian parts and components sector into Global Sourcing policies, followed by the decline of a network of small and medium national auto parts firms built over more than 50 years
Company performance	▪ Increased output ▪ Increased employment creation	"Boom and bust" cycles, linked with fluctuations in the global economy Sharp decline in total sector employment Rising labour productivity Rising vehicle output, followed by declining domestic sales due to recession, modernization of models Rising imports of components, sharp decline in national parts production

3.2 Emerging vulnerabilities

The 1990s brought significant changes to the Brazilian automotive industry, demonstrating not only the substantial process of modernization and expansion experienced during this short period, but also the vulnerabilities that rapid shifts in the productive regime have raised. These vulnerabilities emerge in three main areas: (1) the technological sophistication of the industry, compared with its previous model; (2) the quality and scale of employment which is being generated; and (3) the type of model for industrial development that is emerging.

The experience of import substitution industrialization (ISI) policies in Latin America has been examined by various authors, often in comparison with the East Asian model of export-oriented industrialization (for example, Addis, 1993; Humphrey and Salerno, 2000; Lee and Cason, 1994; Mericle, 1984; Posthuma, 1995). Conventional wisdom states that Latin American industrialization has led to inefficient and high-cost industries, which are incapable of surviving in a context of free market competition. Indeed, case studies have demonstrated the poor performance of many Latin American industries during the 1990s (Chudnovsky, 1996; Katz, 1996).

The Brazilian automotive industry demonstrated dynamism, including significant gains in productivity during the 1990s (Bedê, 1996). In addition, the rapid expansion of domestic demand, joined with macroeconomic stabilization and market integration into Mercosur,[2] made Brazil an attractive location for new investments in the automotive industry. This contributed to the renovation of the industry in general. In many cases, it could be argued that it created a new industry, with the construction of new plants (using modern equipment and the latest forms of production organization in modules) and the geographical decentralization into new regions of the country (Fleury and Salerno, 1998; Posthuma, 1998; and Arbix and Zilbovicius, 2001).

Hence, it would seem that the benefits of market liberalization have been vindicated in this case. The resulting expansion and modernization of the industry's production base and the diversification of industrialization around the country are all positive

[2] The 'Common Market of the Southern Cone' (Mercosur) Agreement, 1994 between Argentina, Brazil, Paraguay and Uruguay.

developments. Other less desirable outcomes have also arisen, however, caused by rapid change and a failure to develop clear national policies for industrial modernization and technology transfer and know-how (Coutinho and Ferraz, 1994).

The present report will examine several of these aspects, namely: (1) the vulnerability of this new industrial configuration, in terms of exposure to fluctuations in international demand and changing strategies of the multinational parent companies; (2) the technological capabilities of the production facilities located in Brazil, as compared with the past and with other production facilities around the world; and (3) the quality and terms of employment being generated by these new investments.

3.3 Trends and transformations

Industrial development policies in Brazil under Import Substitution Industrialization (ISI) succeeded in building a national automotive industry which generated a total net revenue of US$ 29.6 billion in 2001 (including both the vehicle assembly and auto parts industries, but excluding the indirect economic activities related to sales, distribution and repairs of vehicles, which would raise this value further).

As can be seen in Table 3.2, the vehicle assembly sector (including agricultural machinery) generated net revenues of US$ 13.9 billion in 2002, representing around 10 per cent of total Brazilian industrial GDP that year. In turn, the auto parts sector also generated substantial net revenues of approximately US$ 12.4 billion in 2003 or roughly 7 per cent of total industrial GDP that year. Clearly, automotive production is a major industry in Brazil and its recent modernization and expansion, as well as its insertion into regional and global distribution patterns, will maintain its importance in the country's future economic development.

Table 3.2: Net revenue and total employment for assemblers and auto parts producers in Brazil, 1990-2003

Year	Net revenue (US$ billions)**		Total employment	
	Vehicles*	Auto parts	Vehicles *	Auto parts
1990	7.9	12.2	117,396	285,200
1991	8.1	9.8	109,428	255,600
1992	10.0	10.1	105,664	231,000
1993	11.6	13.2	106,738	235,900
1994	13.9	14.4	107,134	236,600
1995	14.0	16.6	104,614	214,200
1996	15.1	16.1	101,857	192,700
1997	16.6	16.5	104,941	186,400
1998	15.9	14.8	83,049	167,000
1999	13.2	10.4	85,117	167,000
2000	14.4	13.3	89,134	170,000
2001	14.6	11.9	84,834	170,000
2002	13.9	11.0	81,737	168,000
2003	n.a.	12.4***	79,153	170,700

Sources: ANFAVEA, 2004; Sindipeças, 2004.

* Data refer to production of automobiles, commercial vehicles and jeeps, but exclude agricultural machinery.

** Prices converted from Brazilian *reais* to US dollar by average exchange rate of each year.

*** Estimate.

As part of a developmental objective, employment generation in this industry has also been significant. More than 400,000 workers were employed by the assembly and parts sectors at the beginning of the 1980s. The human resource development fostered by this industry consolidated a vast range of metalworking skills and know-how of production practices.

However, employment throughout the automotive industry declined sharply in the 1990s. As Table 3.2 also shows, the automotive assemblers employed 79,153 workers in 2003 and the auto parts industry employed 170,700 workers in the same year. As can be seen, one-third of total assembly and nearly 40 per cent of parts employment were shed from this industry between 1990 and 2003.[3]

This sharp decline in overall employment deserves closer examination. It reveals several important issues arising from the modernization process of this industry. Not only does industrial efficiency seems to have involved a reduction in overall numbers of jobs, but also has impacted upon skills and the employment relationship for many workers in this industry. Part of this significant decline in labour per unit of output surely reveals genuine productivity increases. In addition, it is important to consider that the boost in output by auto parts plants, and especially by assembly plants, has been reached also due to an increased quotient of imported parts.[4] Finally, the increased subcontracting of services and some productive activities involves a share of the labour force that is not accounted for in the industry's overall statistics. These subcontracted firms are usually small. Many are not classified as metalworking firms and would not appear in the statistics of the automotive industry associations. As can be seen, not only do these new production and labour force practices contribute important aspects to the overall picture of increased productivity, but also may include less visible practices that can impact upon the stability and quality of employment in this sector, leading to reduced overall earnings and lack of social protection for some of these workers.[5]

As Table 3.3 shows, the Brazilian automotive complex received substantial new investments during the 1990s that have been the primary stimulus for modernization and expansion of productive capacity. Investments by assemblers and parts producers peaked in 1996 and 1997 respectively, but have leveled-off since then.

[3] For an informative and detailed analysis of the subsequent occupational activities of dismissed workers during this period, in which the majority were not able to apply their existing skills in their new occupations and were also found to be working in more precarious employment conditions (i.e. less social protection and less employment security), see Cardoso (2000).

[4] Local content requirements for vehicles between Mercosur countries were relaxed in the 1990s to levels that are now lower than those for NAFTA (which stipulates 62.5 per cent local content of vehicles). Import tariffs between Mercosur countries were gradually reduced and eventually eliminated, according to a timetable currently being re-examined.

[5] Many employees in smaller and in subcontracted firms might be working without the signed work card – *carteira assinada* – that guarantees payment of the company's share of social security benefits to the Government.

Table 3.3: Investments by automotive assemblers and auto parts producers in Brazil, 1988-2002

Year	Investments by automotive assemblers* (US$ million)	Investments by auto parts producers (US$ million)
1988	572	628
1989	602	1,061
1990	790	987
1991	880	764
1992	908	715
1993	886	702
1994	1,195	883
1995	1,694	1,247
1996	2,359	1,296
1997	2,092	1,800
1998	2,335	1,580
1999	1,791	1,020
2000	1,651	1,100
2001	1,750	798
2002	976	260

Sources: ANFAVEA, 2004; Sindipeças, 2004.

* Excludes agricultural machinery.

The preceding discussion has shown the trend in the 1990s of revived sales, increased exports, rising overall output and new investments, in clear contrast to the stagnated sales and outdated production capacity that characterized this industry throughout much of the 1980s. Data from the 1980s reveal the weakening of the ISI model (Castro, 1995; Posthuma, 1994 and Quadros, 1997), as reflected in several indicators. First, stagnated sales were a result of a saturated domestic market that was unable to reach lower income brackets due to the high cost of domestic vehicles. Automotive production had become a low-volume, high-cost industry, as producers tended to concentrate upon production of medium and luxury models, whose higher sales value would compensate the low production scale. Second, low exports also experienced limited potential sales growth, due to poor quality and high cost. It is also worth noting that poor export performance was also due to limited insertion of domestic producers into international circuits of production, distribution and sales. Third, low investment further compounded this vicious cycle of low growth and low productivity, due to outdated plant and equipment, traditional labour organization and management techniques and the lack of consistent quality control. Fourth, recurrent inflationary cycles during this period led to distortions in pricing behaviour (throughout the production chain, by vehicle assemblers, parts producers and vehicle sales outlets). This high cost of domestically produced vehicles (being the result primarily of low productivity and monopoly rents by the assemblers) resulted in stagnated sales. Finally, chronic inflation proved resistant to repeated unsuccessful stabilization packages. Banks were reluctant to offer financing for purchase of durable consumer goods and interest rates were exorbitant. Without financing for vehicle purchases, few consumers were able to purchase an automobile, except via *consórcios*, or buyer groups.

Several key structural features must be considered, in order to explain the behaviour of the Brazilian automotive industry during the 1990s and changes in inter-firm relations during this period (Posthuma, 1998). First of all, external factors with the rapid insertion into international flows of production, distribution and sales significantly increased the competitive pressure upon firms throughout the domestic supply chain. Second, macroeconomic stabilization created a more favourable and attractive environment for foreign investors. During the 1990s, the Brazilian automotive complex followed a "boom and bust" cycle where the factors leading to the boom included macroeconomic

stabilization (as mentioned above) and the sudden growth of domestic demand, at a time of market liberalization and regional integration, when international companies needed to make investment decisions regarding location of new production sites in South America.

In five years, Brazil jumped from the world's 11th producer in 1992 to 8th place in 1997; from 1998 on Brazil was surpassed by China and Mexico, and took its place as the world's 10th producer in 2001. Saturated sales in the industrialized country markets have contributed to making emerging markets significant points for production and sales of vehicles. Local production sites are preferred, rather than exporting to these markets. High import tariffs into these new regional trading blocks further strengthen the attractiveness to install local manufacturing facilities. The experience of Japanese transplants in the United States has shown that local production experiences could work successfully using new manufacturing techniques. The climate of social dialogue which was developed in the traditional manufacturing belt around São Paulo (the so-called "ABC District" which refers to the districts of Santo André, São Bernardo do Campo and São Caetano) contributed toward maintaining industrial peace and negotiated agreements to the reduction of costs at each point of the production chain (Arbix, 1996). The lack of a clear industrial policy at the federal level, however, led to a loss of control over the developmental trajectory of this industry and diminished government influence on the behaviour of multinational corporations in Brazil.

3.4 Bursting the growth bubble

Despite this generally positive environment for new investments in Brazilian automotive production during the 1990s, several key factors contributed to bursting this bubble of rapid growth. Without a doubt, the primary factor was the ripple effect emanating from the Asian crisis in 1998, which deeply affected Latin American markets. This crisis scenario and the resulting drop in demand left thousands of vehicles unsold, making it impossible to sell in a market tipping toward recession. In addition, the rapid increase of new foreign direct investment and the construction of new assembly plants at various points around the country contributed toward creating a situation of installed over-capacity in Brazil. Installed capacity is estimated at 2.3 million (Neue Zürcher Zeitung 23/24 October 2004) while total production was 1.83 million in 2003 (ANFAVEA, 2004). The situation could likely have been ameliorated with a clearer, integrated national industrial policy toward this sector. A reduction in the number of assemblers seems likely, as was seen in the 1950s during the first phase of the Brazilian automotive industry, when an excess of assemblers were permitted access to invest and install production facilities in the domestic market, and a shake-out ensued as the most successful companies emerged (Shapiro, 1994).

In terms of international trade, exports of Brazilian motor vehicles fluctuated during the mid and late 1990s. The geographical destination for these exports also shifted as a result of the impacts of globalization on this industry. The data in Table 3.4 reveal two important trends. First, vehicle exports showed signs of a strong resurgence, apparently arising from increased investments by local companies and new entrants in the mid-1990s despite a dip in 1999. Second, the importance of emerging markets rose, showing the trend for Brazil to specialize in serving specific local and regional markets. The vulnerability to external shocks of the South American markets (in particular those which integrate the Mercosur) forced companies to search for different export markets. The evolution of Brazilian exports to North America has risen significantly (especially to Mexico, which received nearly 76 per cent of Brazilian exports to the region in 2002) and Asia where China was the destination of almost 87 per cent of the Brazilian exports to the region in 2002.

Table 3.4: Exports of Brazilian motor vehicles*, according to region, 1994-2002 (in units)

Region	1994	1995	1996	1997	1998	1999	2000	2001	2002
Africa	1,402	1,773	9,906	23,454	22,695	18,947	18,328	20,985	21,509
Asia and Oceania	1,779	2,088	2,287	3,322	3,311	3,776	7,888	61,253	63,502
Central America and Caribbean	2,132	2,252	1,309	1,891	2,965	2,349	2,311	2,501	7,589
Europe	50,344	35,006	24,980	48,784	75,163	79,100	61,843	18,632	10,206
North America**	2,217	6,894	1,361	7,612	22,774	38,737	111,796	139,371	182,656
South America	318,576	214,557	256.430	331,809	272,971	131,498	169,133	148,114	137,992
Total	377,627	263,044	296,273	416,872	399,879	247,407	371,299	390,854	424,415

Notes: * Includes passenger cars, light commercial vehicles, trucks and buses. ** Includes United States, Mexico and Canada.

Source: ANFAVEA (2002), Table 2.12.

3.5 A positive example of import substitution industrialization (ISI)

As Table 3.5 shows, exports of Brazilian auto parts rose significantly between 1991 and 2003. However, as the other side of the coin, auto parts imports grew over fivefold and the trade balance in auto parts was negative for the first time in decades. In other words, the auto parts sector had been an excellent example of a successful ISI which had grown, had supplied domestic demand for parts, had upgraded in-house technological capabilities and was a significant source of employment generation. With market liberalization, this sector became a net importer of foreign parts, its trade balance turned negative and employment declined during the 1990s.

Table 3.5: Brazilian auto parts trade balance, 1991-2003 (in US$ million FOB)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003*
Exports	2,048	2,312	2,665	2,986	3,262	3,509	4,041	4,031	3,591	3,821	3,677	3,890	4,792
Imports	843	1,060	1,549	2,073	2,789	3,422	4,394	4,175	3,847	4,228	4,198	3,986	4,330
Balance	1,204	1,252	1,115	913	473	87	(352)	(144)	(257)	(407)	(531)	(95)	462

* Data for 2003 are preliminary.

Source: Sindipeças, 2004.

Exports of Brazilian auto parts by region show continued prominence to the North American market (NAFTA trading block), with Europe accounting for one-fourth of exports in 2003 and the Asian market showing good growth prospects as seen in Table 3.6.

Table 3.6: Exports of Brazilian auto parts, by region, 1991-2003 (share of total exports)

Region	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
North America *	53.8	49.2	50.3	48.9	42.8	41.3	40.0	39.3	45.6	44.0	40.7	46.7	41.5
Europe	24.4	20.2	14.1	15.0	17.0	15.3	14.8	18.2	21.0	20.6	22.6	24.3	25.0
South America	14.1	24.8	29.6	30.2	30.5	34.5	37.6	39.4	27.6	28.3	26.9	16.1	16.6
Asia and Oceania	4.8	3.1	3.4	3.6	7.0	6.6	4.9	3.8	3.3	3.9	6.1	8.3	11.6
Africa	2.2	1.9	1.8	1.6	1.8	1.6	1.6	1.2	1.4	1.6	2.0	2.5	4.2
Central America and Caribbean	0.7	0.8	0.8	0.7	0.9	0.7	1.03	1.12	1.05	1.53	1.74	2.12	1.1
Total (in %)	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Sindipeças, 2004.

* Includes United States, Mexico and Canada.

At the country level, by the year 2003, the United States continued to be the largest export market for Brazilian auto parts (32.7 per cent of total exports). Argentina declined in importance as an export market of auto parts from Brazil, and although in2003 it returned to the position of the second largest export market (9.5 per cent of total exports), it is closely followed by Germany (8 per cent) and Mexico (7.6 per cent in 2003). It is worth mentioning the rise of China as an important export market in the decade, as the Brazilian auto parts exports to this country rose from 0.01 per cent in 1991 to 7.7 per cent in 2003.

4. The vehicle assembler's logic: Local strategies, global framework

4.1. Background: General Motors as a global corporation and General Motors do Brasil[6]

The motor vehicle assembler at the head of the three production chains (vehicle seats, braking systems and exhaust systems) examined in this report is General Motors (GM). As Table 4.1 shows, GM was the largest automotive manufacturer in the world in 2003, with total production above 8.2 million vehicles per annum (more than 1.5 million units above the second-ranked Ford Motors).

Table 4.1: World motor vehicle production, by top ten manufacturers, 2003

Company	Total production	Passenger cars (units)	Light commercial vehicles (units)	Heavy trucks (units)	Bus and coaches (units)
(1) General Motors (Opel-Vauxhall)	8,185,997	4,682,656	3,479,713	23,628	-
(2) Ford (Jaguar-Volvo cars)	6,566,089	3,320,706	3,189,662	55,721	-
(3) Toyota	6,240,526	5,369,176	638,748	232,602	-
(4) Volkswagen Group	5,024,032	4,843,085	158,856	15,819	6,272
(5) Daimler Chrysler (with Evobus)	4,231,603	1,819,973	2,149,526	228,461	33,643
(6) PSA Peugeot Citroen	3,310,368	2,934,641	375,727	-	-
(7) Nissan	2,942,306	2,363,155	448,849	130,302	-
(8) Honda	2,922,526	2,868,705	53,821	-	-
(9) Hyundai-Kia	2,697,435	2,275,535	92,504	144,809	184,587
(10) Renault-Dacia-Samsung	2,386,098	2,110,557	275,541	-	-

Source: OICA Statistics, 2004.

As regards GM's global vehicle output, Table 4.2 shows that the USA stands out as the core production site, accounting for nearly half of total output, GM's total international vehicle output. Brazil ranks as GM's fifth largest production site, with 511, 517 units produced in 2003, making this a significant overseas subsidiary.

[6] This section draws on research material in Conceição, J.J., N. Tadashi Oda and O. Rodrigues Cavignato, 1999.

Table 4.2: Major international production sites of General Motors, by country and output, 2003

Country	Make	Total motor vehicles produced	Passenger cars	Light commercial vehicles
(1) USA	GM	3,996,629	1,459,938	2,516,092
(2) Canada	GM-CAMI	982,022	618,149	363,873
(3) Germany	Opel	848,030	848,030	-
(4) Spain	GM	528,060	459,500	68,560
(5) Brazil	GM	511,517	459,500	52,017
(6) Mexico	GM	471,619	106,261	362,329
(7) Belgium	Opel	253,879	253,879	-
(8) China	(Shanghai, but not GM Wuing)	168,991	168,991	-
(9) Australia	GM-Holden	151,866	131,394	20,472
(10) United Kingdom	IBC	124,061	124,061	-

Source: OICA Statistics, 2004.

The local production facility of General Motors do Brasil (GMB) opened in Brazil in 1925, with the installed capacity to assemble 25 imported CKD (completely knocked down) kits per day. Demand from the Brazilian market absorbed all 5,700 units from the first year's production, allowing the company to expand its production rapidly to 50,000 units in 1928. Due to the success of its sales performance, the company constructed a larger plant outside of São Paulo city which began operations in 1930 and which continues operating as its Brazilian headquarters to this day. Production was focused on trucks during the first decades of its existence, thereafter diversifying into light commercial vehicles in 1958.[7]

Despite the existence of an incipient industry based upon the assembly of CKD kits in the 1920s, the true "first phase" of the Brazilian automotive industry began in 1956 with the creation of the Executive Group of the Automobile Industry (GEIA – *Grupo Executivo da Indústria Automobilística*) under federal law. The creation of GEIA marked the beginning of a domestic industrial policy with the objective of creating a national automotive industry. Timetables for increasing levels of local content of parts and components resulted in nearly 100 per cent local content by the early 1960s. In this way, strong local policies to negotiate with multinational corporations created the backward linkages needed to build a strong local auto parts industry and to stimulate the technological know-how and skilled human resources which would enable this industry to survive, grow and gain competitiveness.

When negotiating with GEIA, GMB gave priority to truck production, yet by the early 1960s the company had designed a programme to develop the first Brazilian automobile (the Opala) which involved significant in-house technological development as well as increased employment generation. The company continued to grow rapidly throughout the 1970s during the years of the "Brazilian miracle", surpassing production output of 150,000 units per year. In the 1980s, GMB launched its first "world car" vehicle.

The strategy of GMB during the 1990s focused upon substantial transformations in its systems of administration, production and components supplying. The elements and

[7] This assembler also produced buses, but always on a small production scale which never surpassed its peak of 552 units in 1960. This product line was terminated in 1985.

implications of this restructuring process are reflected in the research results presented in this report. Four particular strategies are outlined below.

The transformation in assembler-supplier relations

GMB adopted the "Global Sourcing" programme from its headquarters. The implementation of this new policy involved the imposition of conditions on its local supplier base. In order to continue on GMB's list of "partners", the prices of parts and components were required to conform to those established in the international market. In concrete terms, this meant setting targets to reduce the costs of production significantly.

Shortening the launch period between new models

Models that had been in production since 1968 (the Opala), 1973 (the Chevette), 1982 (the Monza) and 1989 (the Kadett) were terminated and replaced by a new set of compact, mid-range and top-of-the-line vehicles (including two minivan models) which were launched in 1992 (the Omega), 1993 (the Vectra), 1994 (the Corsa), 1998 (the Astra), 2000 (the Zafira and the Celta) and 2002 (the Meriva).

Changing the product mix

The product mix was altered, largely due to agreements signed in the Sectoral Chamber of the automobile industry,8 which gave a boost to sales of economy models via price reductions. As a result, the production and sales of economy cars rose to 70 per cent of total sales of passenger vehicles in Brazil. Despite the important share of economy models, GMB has sought to maintain participation in all product segments. This was a differentiated strategy from its competitors who, at that time, tended to focus domestic production upon economy models and to import mid-range and luxury models. While compact cars accounted for 60 per cent of GMB's production in 1997, this ratio was 86 per cent for Volkswagen, 94 per cent for Fiat and 100 per cent for Ford. The devaluation of the currency in early 1999 and the ensuing drop in demand forced some vehicle assemblers to re-think their importation strategies and to increase local content of vehicles.

Geographical diversification and development of "greenfield" plants

Greenfield plants using advanced production organization were located in new regions of the country. The growth of economy model sales, as mentioned above, and the intention of most vehicle assemblers to use Brazil as a production platform for the Mercosur market, led GMB to construct two new plants, outside of the traditional manufacturing built around São Paulo city:

- An automotive plant in Gravataí (Rio Grande do Sul state), inaugurated in 2000 to produce the Celta, involving an investment of US$600 million, with a production

[8] The Sectoral Chamber of the automotive industry was a forum for social dialogue between auto companies, trade unions and government (at the local, state and federal levels). The Sectoral Chamber was formed in 1992 and 1993 sought to revitalize the domestic automotive industry through negotiated agreements to reduce taxes, maintain lowered prices and prevent labour strikes (Arbix, 1996). The Sectoral Chamber ceased to function in this same format by the late 1990s, although some policy initiatives proposed by the Brazilian Government in 2004 have sought to revitalize this concept toward industrial policy in a more limited form.

capacity of 120,000 units per year. In 2003, this plant produced nearly 104,500 units of the Celta model;

- A components plant in Mogi das Cruzes (SP State), involving an announced investment of US$150,000.

During the 1990s, the production output and export performance of GMB all rose dramatically, while domestic market share remained stable between 21 and 23 per cent. Table 4.3 shows that production increased and exports rose from 26,140 units in 1990 to 208,411 units in 2003 (despite the over-valuation of the domestic currency under the *Plano Real* stabilization programme). The economy model was responsible for most export growth, especially in CKD form which was sent to South Africa, Russia, the Middle East and other parts of South America. Light commercial vehicles were also important products, where output tripled between 1991 and 1997 and exports accounted for 32.55 per cent of production in 2002. As mentioned above, GMB imported few vehicles in the mid-1990s but took advantage of the overvalued national currency until early 1999 to increase its imports of components, especially for use in its updated product lines.

Table 4.3: General Motors in Brazil: Total motor vehicle production (passenger cars, light commercial vehicles and trucks), 1990-2003

Year	Production GM Brazil (units)	% of GM in total world production	Sales of GM Brazil on domestic market (units)	% of GM Brazil in total domestic sales	Exports of GM Brazil (units)	Exports as share of total GM Brazil production (%)	% of GM in total Brazilian automotive exports
1990	203,334	22.24	170,416	23.91	26,140	12.86	13.95
1991	196,635	20.48	172,368	21.80	27,225	13.84	14.10
1992	213,375	19.87	176,367	23.08	41,543	19.47	12.15
1993	274,972	19.76	255,218	22.56	20,700	7.53	6.24
1994	289,416	18.3	269,323	19.30	21,634	7.47	5.73
1995	344,431	21.14	348,353	20.15	39,206	11.38	14.90
1996	443,708	24.59	383,531	22.16	73,596	16.59	24.84
1997	507,386	24.51	409,632	21.08	111,444	21.96	26.73
1998	415,672	25.64	344,202	22.42	106,007	23.53	26.49
1999	335,836		277,910	22.11	76,582	22.8	27.87
2000	442,231		332,983	22.36	117,146	26.49	31.55
2001	513,558		353,864	22.10	167,723	32.66	42.91
2002	517,167	n.a.	338,940	22.92	187,869	36.33	44.26
2003	511,517	n.a.	333,429	23.34	208,411	40.74	38.97

Source: ANFAVEA (2004).

The data presented in Table 4.3 reveal how decisions regarding investments, production and exports by General Motors in Brazil are increasingly embedded within a global picture of the company's activities internationally. During the 1990s, both production and sales of General Motors do Brasil rose consistently, while domestic market share remained largely unchanged. Of particular interest in this table is the significant proportion of local production which is increasingly being exported – over one-third of

GMB's production was exported in 2002 and GMC accounted for 43 per cent of Brazilian automotive exports in that same year. GMB has clearly taken on a significant role in the company's global production and sourcing strategy.

GMB currently has four factories for vehicle assembly, three of which are in the state of São Paulo,[9] in addition to other units that produce parts and components. The plant located outside the state of São Paulo is the new production site in the state of Rio Grande do Sul, which will be discussed later in this report. Research findings in this section are based upon responses for the two principal plants:

- São Caetano do Sul, which is the site of a former plant constructed in 1930 and which produced three models in the early 2000s: the Corsa; Astra and Vectra. In addition, the production of tooling for both plants is concentrated here, as well as stamped parts for both factories, joining of the car bodies, painting and final vehicle assembly.

- São José dos Campos, which produces the product line of: the Corsa; the Zafira and the Meriva; the S-10; the Blazer and the Montana. This factory has a stamping area, car body assembly, painting and final vehicle assembly. In addition, this plant concentrated the activities of foundry and machining/assembly of engines, as well as the production of axles and transmissions.

The vehicle types and models assembled in each factory are presented in Table 4.4. The renovation of the company's product line since 1993 is noteworthy.

[9] The plant for the production of light and medium commercial vehicles (6 to 16 tonnes) was launched in São José dos Campos. The plant uses North American and Japanese technology, but the company reported local content levels of components between 80-90 per cent. This plant signalled the re-entry of GMB into this product line, two decades after it had left the truck market in Brazil, following a successive loss of market share. This new plant involved investments of US$ 70 million and achieved installed capacity for 20,000 vehicles. Modern management and production techniques were adopted in this plant, using the receipt of sub-assemblies (this is not a Modular Consortium like the Volkswagen plant in Resende, but does operate with the concept of modularity like other factories such as Iochpe-Maxion, Caterpillar, MWM, Rockwell and Eaton). The plant uses numerically controlled machine tools, cellular layout of production, as well as robots and computers for commanding its operations (such as painting, some parts of assembly and windscreen fixing).

Table 4.4: Production of passenger vehicles and trucks, General Motors do Brasil, 1994-2003

Passenger vehicles									
1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Corsa (2)	Corsa (2)	Corsa (2)	Corsa (2)	Corsa (2)	Corsa (1,2)	Corsa (1,2)	Corsa (1,2)	Corsa (1,2)	Corsa (1,2)
Kadett (1)	Kadett (1)	Kadett (1)	Kadett (1)	Kadett (1)	Astra (1)	Astra (1)	Astra (1)	Astra (1)	Astra (1)
Monza (1)	Monza (1)	Monza (1)	Ipanema (1)	Ipanema (1)	Vectra (1)	Vectra (1)	Vectra (1)	Vectra (1)	Vectra (1)
Ipanema (1)	Ipanema (1)	Ipanema (1)	Omega (1)	Omega (1)		Celta (3)	Celta (3)	Celta (3)	Celta (3)
Vectra (1)	Vectra (1)	Vectra (1)	Vectra (1)	Vectra (1)		Zafira (2)	Zafira (2)	Zafira (2)	Zafira (2)
Omega (1)	Omega (1)	Omega (1)		Astra (1)				Meriva(2)	Meriva(2)
Suprema (1)	Suprema (1)	Suprema (1)							
Veraneio (1)	Veraneio (1)								
Bonanza (1)									

Light commercial vehicles									
1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Ipanema (1) (ambulance)	Blazer (2)	Blazer (2)	Blazer (2)	Blazer (2)	Blazer (2)	Blazer (2)	Blazer (2)	Blazer (2)	Blazer (2)
Chevy 500 (2)	Ipanema (1) (ambulance)	Ipanema (1) (ambulance)	Ipanema (1) (ambulance)	Ipanema (1) (ambulance)	Corsa (2) Pick-up	Corsa (2) Pick-up	Corsa (2) Pick-up	Corsa (2) Pick-up	Corsa (2) Pick-up
Veraneio (1) (ambulance)	Corsa (2) Pick-up	Corsa (2) Pick-up	Corsa (2) Pick-up	Corsa (2) Pick-up	S10 (2)	S10 (2)	S10 (2)	S10 (2)	S10 (2)
	S10 (2)	S10 (2)	S10 (2)	S10 (2)	Silverado (2)	Silverado (2)	Silverado (2)		Montana (2)
	Chevy 500 (2)								

Notes: (1) Models assembled in São Caetano do Sul; (2) Models assembled in São José dos Campos; (3) Models assembled in Gravataí.
Source: ANFAVEA, 2004.

The company has targeted export growth, both in terms of vehicles and components. Regional distribution has primarily focused upon Mercosur (absorbing 70 per cent of exports from Brazilian plants), as well as Africa (10 per cent of exports) and other regions (20 per cent of exports).

The following section presents the findings from research conducted with General Motors do Brasil. The responses address the technological and organizational transformations introduced by the company in the 1990s and the beginning of the 2000s, changing assembler-supplier relations and human resource development policies.

4.2 Research findings: Product technology

GMB undertakes a spectrum of different technological activities ranging from simple to advanced. Depending upon the product, the design is either received from headquarters or some division of GM worldwide (normally from GM Opel in Germany); or is adapted locally; or is developed in Brazil using in-house engineering skills. As noted earlier in this report, the Opala originated as its first Brazilian-developed vehicle, demonstrating the intention not only to assemble vehicles in the country, but also to engage in developing the technological capabilities necessary to conduct R&D and design of new products. In 1988, GMB inaugurated its Automotive Technology Centre in São Caetano do Sul, with

professionals dedicated to R&D, who could conduct the technological activities involved in developing new products and improved processes in its factories in Brazil, and now also in Mercosur.

Company managers confirmed that investments in R&D changed in the late 1990s in order to face increased competition and globalization, to keep pace with technological change, to close the technological gap with producers in other countries and to meet the new demands of clients. Integration with the global operations of the parent company raised the possibility of a negative impact upon the R&D and design activities previously conducted in Brazil, as more technologically sophisticated activities were partially re-located overseas to the central design houses of headquarters or in its Opel affiliate in Germany. This situation placed a question around whether the broader industrial developmental goal of conducting manufacturing activities, but also mastering the know-how and technological capabilities required for the development and design of new products would be sustainable in a more globalized production environment. Nevertheless, after this first "concentration" of R&D activities in its central design houses in USA and Europe, in the end of the 1990s GMB had returned to the strategy of designing locally the Celta, a product destined to the Brazilian market. Afterwards, in the beginning of the 2000s, the Meriva was also designed in Brazil, with the participation of engineers from Opel. New laboratories have been inaugurated in Cruz Alta, GMB's main testing ground; in 2002, the Technology Centre moved to a new building inaugurated in São Caetano do Sul. GMB directors affirmed that this change in the R&D strategy occurred in order to achieve more flexibility and to reduce time in the product development process.

GM officials reported that the company has drawn upon internal and external sources to develop and/or improve products developed in-house. Internal sources of technological capability included continuously updating the product line and strategic planning. External sources included ongoing interaction with clients, with headquarters, with equipment suppliers, with suppliers of raw materials and with competitors.

This experience would appear to pose a very important example where greater integration into the global production strategy of GM can offer good scope to build upon, or even reinforce, local R&D capacity and design skills by Brazilian staff in GMB.

4.3 Process technology and organizational innovations

In terms of organizational and human resource policies, GMB has adopted (since the late 1980s) the same guidelines that were first developed in the New United Motor Manufacturing Incorporated (NUMMI) plant which was the joint venture between GM and Toyota in California. "Lean production" procedures have involved changes such as: a suggestion scheme; personnel evaluations; use of the andon light system; operator-checked quality; de-centralization of responsibility to shop floor workers; use of sub-assemblies; kanban;[10] quick die change-over; work teams; standardized materials flow; standardization of activities; and manufacturing cells. In addition, Continuous Improvement Programmes (CIPs) were introduced, which were supported by multi-functional task forces of around 20 people from different sections and levels of the factory. These task forces were coordinated by the company's administration and given one week to rationally reorganize a determined sector of production.

[10] A Japanese just-in-time manufacturing system in which parts are ordered on cards or billboards.

From the start of this programme in February 1992 to December 1994, a total of 1,093 CIPs had been conducted. The result involved a reduction of 47,400 square metres of total area in the two factories in São Caetano do Sul and São José dos Campos and an inventory reduction of between 17 to 82 per cent (depending upon the product) or an estimated total overall saving of US$5.44 million. In addition, productivity gains between 10 and 72 per cent were achieved, which contributed to increasing overall productivity from 20 to 25 vehicles per hour. Foundry material stocks were reduced from two months to eight hours. Die set-up time was also reduced from 103 minutes to 17 minutes. Throughput time (for the vehicle to pass through the entire assembly line) was also reduced from 15 days to one day. These innovations of cellular layout, reduced inventories and limited re-work all reportedly contributed to creating large empty spaces on the shop floor in São Caetano do Sul.

In order to develop and incorporate new organizational techniques in the company, internal factors such as strategic planning and capable in-house staff were important. Salient external sources included interaction with clients, interaction with equipment suppliers and interaction with the parent company. In order to develop and improve its quality system, GMB relied upon permanent review and improvement of productive activities, strategic planning and in-house personnel.

In sum, research results emphasized the primary role of key internal and external sources for the development and improvement of product technology, quality systems and new organizational techniques.

Key internal sources included:

- the permanent review of product and productive activities;
- the importance of policies derived from strategic planning; and
- the capacity of in-house personnel.

Key external sources included:

- interaction with clients;
- interaction with equipment suppliers; and
- interaction with the parent company.

Work organization

Work has been organized increasingly in groups composed of around ten people, with a team coordinator who is selected by management. Reportedly, a great deal of training was required for workers to become multi-skilled and incorporate new work techniques such as quick machine set-up time and Statistical Process Control. A new division of labour resulted from the adoption of these new techniques, as the company sought to decentralize responsibility and decision-making to the shop floor regarding line balancing, information flow, quality control and productivity. As would be expected, many quality control inspectors were no longer required and were absorbed into production activities.

The autonomy of work groups was found to be limited. Some modifications in operational procedures could take place with approval of the supervisor. With the reduction in firm hierarchy, each supervisor began to take responsibility for the coordination of four or five teams, becoming an assistant manager in practical terms. Other supervisors were either dismissed or had resigned during the restructuring process.

According to GMB, all its existing plants (in São Caetano do Sul, in São José dos Campos and Moji das Cruzes, as well as the Gravataí plant[11] in Rio Grande do Sul were very similar to internationally advanced plants. In fact, if one considers the just-in-time delivery of some sub-assemblies to the production line, then all plants were advanced. However, only the Gravataí plant incorporated the latest organizational innovation of having first-tier suppliers installed within the assembly plant at the time of this research.

A shift to multi-skilling

Process innovations had been introduced in terms of automation of car body assembly, painting and the upholstery assembly area. Organizational innovations had also been introduced in the production layout, including participation of workers in continuous improvement procedures. Finally, work organization was altered to include a greater range of between 10 to 12 tasks for each worker, reflecting the shift toward multi-skilling.

To increase market share and client satisfaction, the company updated its model range and diversified its product line in order to serve all segments of the market (as mentioned in section 4.1). Note that this strategy differed slightly from that of other assemblers in Brazil which have focused upon economy models for local production. GMB reported plans to invest US$3 billion by the year 2000 to increase installed capacity, continuously update production processes, reduce operational costs and launch new products. GMB also sought to improve sales by broadening its network of representatives throughout the country and building a new distribution centre in São Paulo state.

GMB reported high-intensity automation of its information systems, design activities, office activities, quality inspection at individual workstations and production sequences.

Maintaining product quality to remain competitive

The quality policy developed by GMB includes quality control in productive processes and a system of guaranteed quality which was still in its initial stages at the time of this research. GMB has received ISO9000 and QS9000 certifications as have nearly all of its supplier firms.[12] In terms of quality and productivity processes, GMB reported all of the following elements as "very important":

- systematic procedures of collecting and registering information about the productive process;
- indicators to evaluate attention to fulfilling productivity targets;
- indicators to evaluate attention to fulfilling quality objectives;
- written procedures for operating processes; and
- degree to which these indicators and procedures generate corrective action.

Shop floor workers participated actively in the application of quality control standards, by regularly performing routine preventative maintenance and participating in groups or quality circles. In more selected cases, activities such as visual inspection of the

[11] See also section 4.7 of the present report.

[12] ISO9000 and QS9000 certifications have become so widespread in the Brazilian auto parts industry in general that they constitute a type of prerequisite, or "identity card", for companies as a sign of their manufacturing competency.

product, inspection with measuring instruments and noting of results on an SPC chart were also conducted.

Inventory reduction has been a key factor in achieving an effective just-in-time system. In terms of receipt of supplies, GMB reported an average of 1.5 days of inventory for all inputs received, but indicated that 1 day would be the target desired. Furthermore, the company cited much lower inventories for certain products, such as car seats (which had only one hour of inventories)[13] and axle systems (which also had only one hour of inventories). These two cases of car seats and axle systems played a role as leading product areas which were being tailored to work within the modular concept of receiving sub-assemblies which are pre-tested and quality-guaranteed and delivered directly to the assembly line.

The scale of production of the main product line at each Brazilian factory was reportedly comparable to that of GM's main international plants in the late 1990s. This production capacity enabled the company to reach "significant" economies of scale in these plants. GMB introduced modern techniques of production management during the 1990s, which have yielded improvements in production indicators. Those areas of "very important" improvement included increased production cycles, improved conditions of work and safety in the plant and reduced environmental pollution. In terms of "important" improvements, the company cited reduced idle time, reduced inventories, reduced waste and better quality control of products.

4.4 Inter-firm relations

The new concepts transferred from the NUMMI experience also included the application of external just-in-time to the supplier chain. Combined with the use of the kanban system to reduce lot size, the company was able to reduce external and internal stocks. In the early 1990s, GMB adopted a new quality standard that was introduced among its suppliers of parts, components and raw materials. The stricter quality standards established a maximum defect level of 250 defective parts per million (in other words, for each shipment of parts, the number of parts which failed to conform to GM standards could not surpass 0.025 per cent). Clearly, such rigorous standards could not be imposed overnight – their adoption involved careful guidance and training. Hence, GMB introduced its OTIMO programme during the mid-1990s, in order to assist supplier firms in the new techniques for quality improvement at that time.

OTIMO (Optimization of Time, Inventory and Labour)

Under OTIMO, a specialist from GMB would be sent free of charge to the supplier firm for one week of intensive work. The GMB specialist would analyze the component producer's cost structure, inventory levels, production layout, labour costs and production indicators (such as manufacturing lead time). The supplier's staff would also be involved in this process of analyzing production, identifying problems and implementing changes. The GMB specialist would begin by selecting one area to serve as a pilot project; when this area had been restructured, the consultant would then depart and leave the firm's staff to carry on with diffusing changes through the rest of the factory. These services were also extended to several firms which were potential, but not current, GMB suppliers (Posthuma, 1995, p.1).

[13] The case of the car seat supplier is described in greater detail in section 5.1.

By offering these services quickly and free of charge, GMB reportedly saw a rapid response in its supplier base, as firms were not restricted by cost, nor the time delay of waiting for a consultant to come on site. By the end of December 1993, GMB had conducted the OTIMO programme with 200 suppliers (responsible for around 90 per cent of total material purchases at that time) (ibid). The OTIMO programme was also reportedly introduced in five of its parts suppliers in Argentina (Gazeta Mercantil, June 10-12, 1994).

Global sourcing

In terms of its components purchasing policy, GMB sought to adopt the "Global Sourcing" policy that was introduced by GM worldwide. As noted earlier in this report, this new policy imposed the condition on its local suppliers that prices of parts and components must be competitive with prices in the international market, if they wished to continue as "partners" in supplying components. In order to help suppliers to introduce changes that would reduce their costs of production, GMB offered various courses, sent technical staff to visit component firms overseas and provided technical assistance.

Over time, a policy such as global sourcing will contribute to reducing their supplier base, as a fewer number of component producers have been selected under the more rigorous standards. For this reason, it was curious to note that GMB reported an *increase* by approximately 20 per cent in the late 1990s in the number of suppliers. The supplier network was reportedly composed of 450 active suppliers. One explanation for this increase in supplier firms at that time is that the company lists both components producers and service providers as "suppliers". Hence, increased outsourcing of services such as cleaning, restaurant and security services should not be confused with suppliers of manufactured goods such as components. Second, the launching of new products also contributed to increasing the number of components suppliers required.

Outsourcing

The intensity of increased outsourcing was considered "important" by GMB. The company indicated that outsourcing was adopted for the following reasons (in order of importance): (1) to focus on the core business; (2) to reduce production costs; (3) to increase productive capacity; (4) to flexibilize production; and (5) to increase quality of product and processes. In the specific case of services, the primary objectives in outsourcing (in order of importance) included: (1) to focus on the core business; (2) to reduce costs; and (3) to improve the quality of services. Table 4.5 shows the extent of outsourced services at GMB.

Table 4.5: Extent of outsourced services at General Motors do Brasil, 1998

Entirely outsourced	Partially outsourced	Retained and conducted in-house
Cargo transport	Restaurant	Medical assistance
Cleaning	Security	Accounting
Transport of employees		Payroll
Informatics assistance		Marketing
		Recruitment of personnel
		Sales

Source: Research questionnaire.

The four principal criteria used in the selection of suppliers were presented as: lower prices; faster delivery periods; larger size of the firm; and quality of services. One of the major suppliers cited was Delphi, which was the components division of GM worldwide. It is worth noting, however, that the role of Delphi changed drastically during the 1990s. Traditionally, GM was one of the most vertically integrated assemblers in the world, producing over 75 per cent of its components through its own network of owned companies. With increased competition in this industry, the adoption of Japanese production techniques and new concepts of assembler-supplier relations, as well as the need to concentrate upon "core activities", GM corporation reduced its role as a components producer and started sourcing from a greater variety of firms.

As a corollary, the primary reasons for terminating a supplier relationship included: changes in purchasing policy (moving to supply complete sub-systems); the decision of the supplier to stop supplying; changes in the client's product; and the supplier going out of business.

As noted elsewhere in this report, Brazilian producers made great efforts during the 1990s to increase quality standards, and these demanding criteria started to diffuse throughout the production chain. Most supplier firms either had received ISO and QS9000[14] certifications, or were in the process of preparing for ISO and QS9000 evaluation.[15] .

GMB indicated no preference for exclusive supplier contracts. In terms of duration of contracts, it was specified that suppliers which received medium-term contracts (for 1-3 years) were not competitive at a world level, and those with long-term contracts (3 years or more) were more technology- and capital-intensive. GMB specified the following elements in their contracts with suppliers:

- criteria for the distribution of benefits which arise from improvements in productivity between client and supplier;
- guarantees about minimum volumes of purchases;
- quality levels and/or maximum permitted level of defective parts;
- conditions and frequency of delivery;
- penalties in the case of the supplier (or in the case of the client) not fulfilling the conditions of the contract; and
- conditions which permitted the supplier (or the client) to terminate the contract prior to its completion.

GMB increased its receipt of modules and systems, rather than individual parts and components. Those suppliers that could supply modules and systems were encouraged to install inside of the same factory as the assembler.

It was interesting to note that component delivery was changing from receiving all major items just-in-time to a new method called the "milk run", which inverses this logic.

[14] From January 1, 1998 GMB began to require all its suppliers to have QS9000 certification.

[15] Interviews with several supplier companies had to be re-scheduled at various times, as they were fully engaged with preparing for visits of ISO9000 auditors and received no visitors during these periods.

Instead, GM would reportedly start collecting the parts and components required at the supplier's factory. The term was adopted from the dairy industry where a truck collects milk at the door of the various agricultural producers. In this way, GMB intended to eliminate two risks for its factory – not receiving parts on time and being closely tied to one single supplier. This same process also began to be adopted by Ford, which called this a "time window", where one truck will collect various parts from different suppliers, optimizing the total cargo which can be transported by one truck.

It is important to note that this shift from component delivery by the suppliers to collection by the assembler represented a radical change from the trajectory of just-in-time supply, which has been the general trend in the automotive industry during the 1980s and especially the 1990s. This shift evidently involved greater cost and effort for the assembler, at a time when most assemblers were passing increasing responsibility, risk and cost to the supplier base. Indeed, as seen earlier in this section, some supplier contracts included clauses that charged fines for late delivery of parts and components that stopped the production line. This practice introduced activities which may not support the logic of sub-assemblies and sub-systems that are assembled and delivered by first-tier suppliers. If the goal of assembling was either to receive sub-assemblies delivered to the assembly line, or have suppliers located within the assembly plant, then it was unclear why the assembler would collect parts and components.

Component delivery

Consistent with the new logic of industrial organization in the automotive industry, the vast majority of GMB's suppliers were reportedly located within a radius of 180 kilometres of the assembly plant. GMB indicated its reasons as follows: greater security in just-in-time delivery; ease of transmitting new concepts to suppliers and; lower transport costs.

The technological capacity of suppliers continued to be of importance to the assembler. GMB noted that the major changes in the policy of supplier selection involved proven QS9000 certification and in-house technological capabilities. This technological capability was indicated as "fundamental for the continuity of business with new projects". In these cases, suppliers could propose modifications in the product design.

The assembler provided assistance to its suppliers, aiming to improve the productivity and quality of the supplier base. Several forms of assistance included: help in the organization of production; technical and operational training; information about technological changes; help in activities of quality control; and help in product development. Other forms of assistance that were offered but were less frequently mentioned include: advance payment; use of the laboratory; help in the maintenance of machinery and equipment; joint purchasing of inputs; and help in accessing lines of credit.

Table 4.6: Sources, intensity and type of in-house technological learning at GMB, late 1990s

In-house sources	Intensity	Type of technology
Experience of in-house staff	Very important source	Product and process technology
Skills of in-house staff	Very important source	Process technology
Routine studies of methods and techniques	Very important source	Product, process and packaging technology
Formal R&D activities	Important source	Product and process technology
Non-routine studies of methods and techniques	Medium important source	Process technology

Source: Research questionnaire.

In terms of its own technological capability, GMB placed great value on the experience and skills of technical staff and the use of routine studies of methods and techniques to identify areas for improvement, as seen in Table 4.6.

4.5 Human resource policies

In the 1990s, the minimum requirements for new employees were to have completed primary school education, to have held a successful hiring interview and to have undergone a practical group dynamic test. The salary policy of the company provided incentives for productivity gains, low absenteeism, fulfilling pre-set goals and contributing to improvements in the production system.

The restructuring of production, described earlier, aimed to induce greater involvement of workers and training, in order to enable them to work at four levels: assisting; working directly in production; supervising; and teaching. The system of remuneration was also adapted accordingly, in line with the knowledge and capabilities of workers.

Employment followed inverse trends in both GMB factories during the 1990s. In São José dos Campos, employment increased from 8,300 workers in 1980 to 11,100 in 1997, primarily due to the increased production of the Corsa model, the operation of the new truck factory and expansion of the engine unit. In contrast, employment in São Caetano do Sul fell from 12,300 in 1980 to 9,700 in 1997 as it lost some of its former activities of tool-making and design/engineering for the "world class" models to other GM units around the world.

Staff training was increasingly understood to be an investment and not a production cost by leading companies around the world. The research results indicated that GMB provided training for machine operators working directly in the production process, higher-level personnel in the production area, indirect workers and administrative staff. Indeed, the company reported adopting six training modules to prepare workers for new skills requirements: (1) notions and techniques for teamwork; (2) techniques for participating in and leading team meetings; (3) standardization of tasks; (4) problem analysis I (introduction); (5) problem analysis II (case studies); and (6) quality skills.

When ranked in order of importance, the most important abilities were "behavioural skills" which included attitudes, teamwork and initiative, in addition to general technical skills (with lesser emphasis on skills of mathematics, statistics and design).

Table 4.7: Ranking of skills for production workers at General Motors do Brasil, late 1990s

Very important	Important	Moderately important
Ability to work in groups	Follows instructions	Notions of mathematics
Desire to learn new skills		Notions of statistics
Taking initiative		Can interpret designs
Technical skills		

Source: Interview questionnaire.

GMB rated worker performance systematically and on a regular and individual basis. As noted in the case of supplier firms elsewhere in this report, companies commonly continued to evaluate their workers on an individual basis, even though workers were asked increasingly to work in groups and recruitment criteria reflected an emphasis on skills for working in groups and teams, as seen in Table 4.7.

4.6 GMB's activities in Mercosur

In the end of the 1990s, GMB sought to integrate its productive and commercial activities in the regional market, especially in Brazil and Argentina. In this way, GM linked its regional production capacity and amplified production scale through the specialization of vehicle platforms and/or models to be produced in each country in the regional block. Table 4.8 shows GM's real and planned investments in South America in the late 1990s.

It is worth contrasting GM's relatively limited bilateral exchange of vehicles in the late 1990s between factories in Brazil and Argentina, especially when compared with its leading competitors. This was primarily because GM resumed its production in Argentina and had two plants in the late 1990s – one in Córdoba for pickups and another in General Alvear (Rosário province) for the Corsa model. The strength of the Argentine peso, especially following the devaluation of the Brazilian real in 1999, contributed to preferences among most assemblers, including GM, to focus production in Brazil leading to a collapse of GM's production in Argentina for export to Brazil, as seen in Table 4.7.

At the time, in the late 1990s, GM also installed a distribution firm and announced plans to invest in the production of parts and components in Paraguay. The company installed a factory in Uruguay for the assembly of CKD kits imported from Brazil, and evaluated the possibility of investing in production of parts and components. These plans also failed to move forward in the following years.

Table 4.8: Real and planned investments by General Motors in South America, late 1990s

Factories	Recent and planned investments (US$ million)	Built area (m^2)	Products and models	Installed production capacity	Activity	Employees
São José dos Campos – SP	3,000	2,657 million	- *Corsa: Wind, Super, GL, Sedan, Wagon & Pick up* - Zafira - S10 & Blazer - engines & transmissions	1,100 units/day		11,200
São Caetano do Sul – SP		577,369	Astra, Vectra, , Corsa (painting)			
Gravataí – RS	600*	140,000 built area by GM; 4 million total land area	Celta	120,000 units/year		2,000
Mogi das Cruzes – SP	150*	80,000	Components Stamped parts		Production of discontinued vehicle body, assembly of sub-systems for vehicle bodies, soldering of parts and painting	500
Córdoba – Argentina			Passenger Cars Silverado Pickups	25,000 units/year		
Rosario – Argentina	1,100		CKD Assembly of Corsa	85,000 units/year		

Notes: * includes investments of supplier firms.

Source: Gazeta Mercantil – Panorama Setorial, 1998; research interviews.

Table 4.9: Sales of Argentine passenger vehicles in Brazil, by General Motors, 1991-2003 (units)

Year	Passenger Cars	% of GM in total imports	Light commercial vehicles	% of GM in total imports	Heavy commercial vehicles	% of GM in total imports
1991	0	0.0	218	100.0	0	0.0
1992	0	0.0	417	100.0	0	0.0
1993	0	0.0	379	11.2	0	0.0
1994	0	0.0	1,560	31.6	0	0.0
1995	0	0.0	11,798	79.8	0	0.0
1996	0	0.0	12,644	90.8	161	19.3
1997	0	0.0	15,922	42.9	91	22.9
1998	13,873	8.0	13,543	26.6	0	0.0
1999	22,402	17.7	4,845	13.1	0	0.0
2000	9,160	15.1	85	2.5	0	0.0
2001	5,542	6.5	1,456	4.6	0	0.0
2002	334	0.87	385	1.9	0	0.0
2003	3	0.01	737	4.5	0	0.0

Source: ANFAVEA, 2004.

4.7 The transition to modular assembly: The Gravataì plant

In the late 1990s, GMB built a new assembly plant in the city of Gravataí in the state of Rio Grande do Sul - the first GMB plant outside of the state of São Paulo, reflecting the geographical diversification of the Brazilian automotive industry. This plant deserves attention as GMB management announced it as a "revolutionary" new step in production practices which was likely to diffuse not only to other GMB units in Brazil, but possibly to other GM plants around the world.

Rio Grande do Sul was selected as the site for the new factory due to its proximity to other countries in Mercosur, according to GMB. Furthermore, the municipality of Gravataí is situated merely 17 kilometres from the capital city of Porto Alegre, and the government from Rio Grande do Sul offered GMB fiscal and financial incentives in order to attract the new plant. The new "industrial community" has a core vehicle assembly plant surrounded by the majority of its first-tier suppliers in the same area.

The Gravataí plant produces the Celta, a sub-compact model (a "mini-Corsa"), to compete in the economy car segment, in order to be accessible to lower-income groups. Productive capacity was forecast to be 120,000 passenger vehicles per year, with estimated annual net sales revenues of US$ 1 billion.

In addition to introducing a new relationship with suppliers, the new project has been ambitious in terms of the degree of automation utilized, the reduced number of hierarchical levels of management and the organization of work. The company has aimed to achieve lower costs via the new vehicle design, as well as new production organization based upon modular supply of components built into sub-assemblies and delivered directly to the assembly line. The vehicle assembly has been divided into 17 modules, each being the responsibility of a different first-tier firm located in Gravataí, GMB will only be involved with the final assembly. The suppliers selected for this plant are presented in Table 4.10.

In the same format as other new "modular-based" factories in the country, especially the Volkswagen truck plant in Rio de Janeiro state and Paraná (Bresciani and Cardoso, 1999), the Renault plant in Paraná and the Mercedes-Benz plant in Juiz de Fora, Minas Gerais state, the Gravataí plant was designed to involve the coordination of a lean structure of first-tier suppliers. These suppliers, in turn, coordinate a production chain of second-tier and third-tier suppliers.[16] GMB stated that its sourcing preference would allow modular suppliers to be responsible for approximately 70 per cent of all components and the remainder should be the responsibility of around 90 external suppliers. In exchange for long-term contracts with its suppliers, the assembler sought to receive supplies at guaranteed price, quality and delivery periods. The assembler, together with its 16 module suppliers and 10 other commercial and service companies, planned to form a total of 27 companies in the entire complex.

[16] These new models of industrial organization and inter-firm relations, as well as their implications for labour and future industrial development in Brazil have been a source of intense interest among researchers and specialists in this industry, including Marx, Zilbovicius and Salerno (1997), Salerno and Zilbovicius (1997), Posthuma (1998), Fleury and Salerno (1998) and Dias (1998).

Table 4.10: Suppliers of sub-assemblies to the Celta plant, Gravataí, Brazil

Company	Product
Lear Corporation	Car seats, ceiling fabric and door lining
Arvin Exhaust do Brasil Ltda	Exhaust pipes
Delphi Automotive Systems Ltda	Front and rear suspension, rear axles
VDO do Brasil Ltda	Instrument panel
Bosal – Gerobrás Ltda	Tooling sets
Valeo Sistemas Automotivos Ltda	Air cooling system
Indústrias Arteb S.A	Electrical lighting system
IPA	Gas tank
Sekurit Saint Gobain	Windows
Goodyear do Brasil – Prod. de Borracha Ltda	Tyres and wheels
Ti Brasil Indústria & Comércio Ltda	Fuel lines and braking system
Fanaupe	Mounting elements
Pelzer Systems	Bumper and plastic-injected parts
Polyprom Indústria & Comércio Ltda	Light stamped parts
Inylbra Tapetes e Veludos Ltda	Sound protection and carpeting
Sogefi	Air cleaners
Zamprogna S.A	Blanks (preparation of the sheet steel for stamping

Source: Gazeta Mercantil, 18/7/2000; Graziadio, 2001.

5. The components supply chain: New production practices and changing inter-firm relations

5.1 Transformations in the supply chain

The specific findings of this research are discussed in the following section. It should be noted beforehand that two main indicators may largely explain the behaviour of companies in the automotive sector: their product line and their origin of capital. Some interesting tendencies regarding these indicators are described below for each of the three product lines examined in this research.

The product line

Brake systems. The company producing brakes was a family-owned firm, in a product line involving intensive engineering capability. Brakes are a core mechanical component and a key safety device, intrinsic to the reputation of the automotive manufacturer and the safety of vehicle passengers. Hence, it is a product line that requires capable, experienced staff, complex in-house engineering skills and the technological capacity not only for adaptation but also for development and design techniques. Because technological developments are rapid, sophisticated and costly in this product line, it is essential that in-house technological capability be constantly renewed. This requires close contact with overseas companies, frequent travel for technical staff and skills upgrading throughout the entire production process, from R&D and design to shop floor production. In some ways, it is surprising that this product line had remained in the hands of a family-owned Brazilian firm, when multinational subsidiaries are normally leaders for this item. It is perhaps even more surprising to learn that a multinational brakes producer, which had been a major competitor in Brazil for many years, had lost market share and competitiveness to this Brazilian manufacturer.

Inter-firm relationships appear to be influenced by these factors. First, in terms of relations with the assembler, this company sought to provide advanced technology, total product quality and excellent services to its clients. Second, in terms of relations with technology suppliers, this company developed a licensing agreement with one of the world's leading brake manufacturers. As a result of a successful licensing relationship, the licenser offered to buy shares in the Brazilian firm. The English technology licenser helped to maintain the technological leadership of the Brazilian firm in the local market. In the late 1990s, this Brazilian firm was bought by the English technology company, making it a multinational subsidiary. Finally, inter-firm relations with supplier firms tended to be close and involved substantial exchange of information and services.

Exhaust pipes. The company producing exhaust pipes was part of a Brazilian-owned conglomerate of parts-producing companies. The exhaust pipes division was sold in the mid-1990s to an Italian auto parts producer and the new ownership has considerably influenced the behaviour of this company. Several of its suppliers were changed to companies that also supply the mother company in Italy. In contrast to brakes, exhaust pipes are quite simple in terms of product technology and process technology – an excellent example of high-scale low-cost production. A major factor in maintaining competitiveness is to dominate a large market region. This firm, therefore, has sought to open new market opportunities in Brazil.

Car seats. The company producing car seats was a subsidiary of an American producer. This company installed in Brazil, in response to the encouragement from the American vehicle assemblers in the late 1990s. Its competitive position provides an interesting counterpoint to the two other parts suppliers in several noteworthy respects and offers an important insight into future tendencies in the international automotive industry.

The key element of competitive car seat production is not the mastery of sophisticated technology but of sophisticated **logistics**. The essential point is to organize the flow, assembly and delivery of this product in the most efficient manner possible. A visit to the factory reveals the logic of this production perspective. The inside of the factory is extremely simple, consisting mainly of the area where the steel frame of the seat is joined with the foam support and cloth covering, where final quality control is conducted and where the seat is covered with protective plastic.

Behind the deceptive simplicity of its production operations was the essence of this factory's logic – the efficient timing of receipt and shipment of goods. In terms of inputs, most products were outsourced: foam seating; steel seat supports; and seat covers (the seat cloth was shipped from São Paulo to Minas Gerais state, where women workers earned substantially less than their counterparts in São Paulo to cut and sew the seat covers). The receipt of these inputs was carefully timed in order to reduce the amount of space occupied by stocks.

Efficient product manufacture and delivery was the core of the company's operations and explains why the American headquarters opened a subsidiary in Brazil. The entire production line followed the precise sequencing of the production flow in the assemblers' factory. Sequencing was transmitted electronically and printed directly on the shop floor of the supplier, specifying the colour, model and finishing details of each set of seats and the order in which they were being produced. According to these specifications, the supplier produced a series of seats using just-in-time work flow methods. Finished seats were then loaded onto a truck with a specially-designed conveyor belt where seats were stored in the sequence specified by the assembler's order sheet. A truck would leave the supplier's factory every 20 minutes with a load of seats that were delivered directly to the assembly line and offloaded onto an automatic conveyor belt, in exact sequence of the vehicles that were being assembled.[17]

Thus, in less than two hours, this supplier was able to receive the order, assemble the seats, check seat quality, cover them in protective plastic, load and deliver them directly to the final assembly line in the precise sequence necessary, with no intermediary stocks and no delay involved. In many ways, this production layout can be seen as another step closer to so-called "virtual production", where the actual technological capability and manufacturing of products is less important than the planning, selling and delivery of the products.

The trend toward modular production and industrial condominiums was discussed in section 4.7 of this report. The first steps toward achieving this newly introduced model of production organization have been tested out with certain product lines that are more conducive to this type of flexible and integrated production. Over the years, various

[17] In this case, the assembler removed a wall of its factory, in order to install a special loading area where the suppliers' truck delivering car seats could drive beside the plant, connect its conveyor with another conveyor inside the assembly plant and unload the car seats in sequenced order directly onto the running assembly line.

factories around the world have tested the model with certain basic components that can be joined into a sub-assembly or module and delivered directly to the final assembly line.[18]

5.2 Changing production and sourcing practices in the Brazilian auto parts industry

Origin of capital

It was observed that a large number of the parts producers examined in this research – in both the first and second tiers – had been founded between the 1940s and 1960s, during the first phase of this industry. In contrast, the supplier of car seats was established during the second phase in the 1990s.

The first-tier exhaust pipe producer traditionally produced all of its own inputs. However, after the company was bought by an Italian multinational company, the firm adopted a strategy to decentralize the production of inputs to second-tier supplier firms. These so-called "satellite" firms were all contracted during the 1990s and were under 100 per cent local capital ownership.

In terms of capital origin, all first-tier parts producers of brakes, car seats and exhaust pipes were under 100 per cent foreign ownership. It is important to note that two of the firms were formerly held under Brazilian ownership, but recently sold to major multinationals during the rapid process of denationalization of the local parts industry throughout the 1990s. The producer of exhaust pipes had been bought by Maretti Marelli, the Italian components producer which supplies mainly to Fiat. The brakes producer was bought by Lucas Varity of the United Kingdom (which had previously been a minority shareholder for many years). In turn, Lucas Varity was purchased by TRW, the major US components conglomerate which has acquired numerous parts firms with diverse product lines, around Latin America, in order to create a vast network of production throughout the region (*Financial Times*, 20/01/99). The second-tier parts firms were primarily under Brazilian capital.

Hence, the first-tier parts producers became part of the portfolio of major multinational producers that, in turn, have been increasingly consolidated at an international level. As stated earlier in this report, the auto components industry has moved from being a highly fragmented industry to be concentrated in the hands of a few dozen companies, which manage the production and distribution of a vast network of producers worldwide for the automotive assemblers on a global scale. An important question to explore is whether this integration into a multinational network will permit further penetration of international markets and increased production scale, as part of the "global sourcing" concept. Alternatively, one may consider whether control by multinational headquarters would proscribe more restricted regional markets for different producers within its network. The evidence in the late 1990s indicated that components and parts firms supplied mostly to Brazilian-based companies and that their exports were largely restricted to Mercosur countries. A more limited amount of components and parts was being exported to the United States and Europe in the period. In the beginning of the 2000s, however, with the crisis in Argentina, exports to this country have declined dramatically. According to Sindipeças (Brazilian Association of Autoparts Industry) in

[18] The Ford Hermosillo plant is one of the first examples of this production organization in Latin America, in which several core suppliers (of products such as seats, rubber foot mats and body paint) built their plants a few minutes away from the assembly plant, in order to deliver just-in-time 24 hours a day.

2002, total Brazilian auto parts exports to Argentina represented 50 per cent of the amount exported in 2001. At the same time, exports to the USA and Europe (especially to Germany) have risen. Even more important was the rise in the exports to emerging countries such as Mexico and China: exports to the latter have increased by 77 per cent from 2001 to 2002.

In contrast to the Japanese model of capital participation in components and parts firms throughout the chain, no capital relationship was identified between companies in the production chains that were examined in this research.

The second-tier suppliers of the exhaust pipes producer held a special relationship with the first-tier firm, which loaned machines and tooling under a licensing contract in order to permit the "satellite" firms to begin operation.

5.3 Firms established in Brazil since 1990

A manager in the first-tier supplier of car seats outlined the principal motives of its parent company for installing in Brazil:

- the possibility and perspective of a growing and promising market;
- the opening of Mercosur, with Brazil as a principal participant;
- the stabilization of the currency; and
- the availability of raw materials and specialized labour.

The motives outlined by other companies emphasized factors which guaranteed increased capital returns in Brazil.

The installation of this company in Brazil supported the assembler's strategy to receive car seats just-in-time, as illustrated by the following comment by the Production Manager:

> "To the extent that we assemble car seats in a sequenced just-in-time process, we meet the expectations and strategy of the assembler who seeks zero stocks, total quality, reduced production area, etc."

This car seat supplier expressed the view that the following factors are important to prevent the assembler from adopting a policy of importing car seats from other countries (in order of priority):

- the just-in-time buying policy of assembler clients;
- transport costs (from overseas); and
- the need for close contact between suppliers and assembler clients.

Regarding plans to expand or modernize its installations, this car seats firm considered the possibility of limited expansion to meet the growing demand of the assembler but the current factory had already been constructed in line with its other subsidiaries around the world and operated in line with the standards of the most modern international factories.

This supplier also had the requisite conditions to supply the assembler in other regions of Brazil. However, this would have involved compromising the concept of

sequenced just-in-time supply to a certain extent,[19] and also would have involved additional costs of transport and inventories.

The supplier also expressed a broad and integrated vision of its future opportunities and the strategies to be adopted for the company to be successful. It also described a strategy to increase the local content of parts used in the production of car seats, to meet its goal of "production in Brazil, at a lower cost, of a range of components that are currently imported". Its long-term strategy included the goal of producing advanced-technology components in order to not only produce car seats, but also the entire vehicle interior – in other words, moving to modular production. The General Manager of the company identified its principal challenges as being "continuous quality improvement, efficiency and increasing market share".

These comments show this company has pursued the general tendency observed in the automotive market to supply complete modules to the assemblers. This tendency also can be seen in the case of the brake systems producer, which started to deliver complete sets of axle and suspension systems to which brakes are attached later. This has caused a new arrangement between first-tier and second-tier suppliers in the production chain – a trend that will be treated in greater detail in the following section.

5.4 Joint venture suppliers

The only joint venture in the research sample was a second-tier supplier of car seats parts, comprising a 50:50 share ownership between a Brazilian and American company. Examining the research findings, it becomes clear that this joint venture association emerged out of the need for technological support and the need to act in a globalized context with other automotive sector clients.

The company indicated that the principal factors that contributed to the formation of this joint venture were linked with product and process technology and the need to increase market share. Without this partnership, the Brazilian-owned firm would not have succeeded in producing the quality and quantity required by clients (in addition to its limited prospects for increasing market share). The partnership permitted the introduction of a new machine with a degree of automation that enabled the company to achieve high-quality production (the technology aspect is discussed in detail in sections 5.6, 5.7 and 5.8 of the present report). This machine is of such great strategic importance, that the researcher's factory visit was restricted to certain sections, to prevent viewing the machine's full operations.

As regards new opportunities, the company identified the possibility of constructing a new factory in Curitiba and Porto Alegre. Its main challenges included: (i) maintaining its market position; and (ii) constructing factories where automobiles will be assembled. This appears to be a tendency among parts firms – to construct factories in the locations near assembly plants. This aspect is at the heart of the strategic planning of this company.

5.5 Suppliers established before 1990

The firms in the research sample ranked the principal challenges facing suppliers that were installed prior to 1990 as:

[19] Sequenced just-in-time supply (or "just in sequence", according to Stryck, cited in ILO, 2000) refers to programmed delivery, with less than two hours involved from receiving the supply request to the delivery of a variety of final products of different specifications directly to the assembly line.

- the introduction of electronically controlled equipment;
- increasing the level of technological sophistication;
- raising the volume of production; and
- increasing the quality of products produced.

The introduction of new technologies was in line with developments taking place in Europe and the United States. The issue of product quality has gained greater attention due to pressure from vehicle assemblers and increased competitive pressure arising from globalization.

Companies interviewed commonly practiced outsourcing and subcontracting, especially in areas not related to what was defined as the core area of business, or in areas of low value-added activities. In general, areas most frequently out-sourced involved cleaning services, security, transportation, the restaurant and production of tools. In fewer cases, accounting and some areas of production of specific parts that were previously produced in-house were outsourced. Perhaps the most evident case of this practice was demonstrated by the first-tier exhaust pipes producer that adopted the concept of "satellite" suppliers which produced 70 per cent of the parts used in its production.

In the production process, a generalized trend could be identified to move toward more flexible production processes. This trend included the adoption of concepts such as cellular production, decentralized control over the production process and changes in production lay-out in order to achieve more rational and flexible production flows. In some cases, the changes in the production process compensated for reduced investments in more advanced production equipment. In these cases, firms had a low degree of automation, but adopted more advanced forms of production organization and management.

In terms of logistics, firms commonly adopted methods to reduce stocks through concepts such as just-in-time and kanban. The adoption of these practices was also associated with the introduction of more sophisticated information systems and processes in order to meet the demands of the market and of clients in general.

Relations with suppliers throughout the production chain had become much more demanding and involved a reduction in the total number of suppliers. At the same time, it brought a closer degree of collaboration between surviving suppliers and their clients, especially in the development of specific forms of supply and production, including the diffusion of technology to suppliers. In general, product designs were adapted by suppliers, according to the technological resources available. This involved increased trust and partnership between assemblers and suppliers. While assemblers demanded ISO9000 and QS9000 certification from first-tier suppliers, the trend for quality improvement has diffused through the production chain, and first-tier suppliers demanded the same certification from their second-tier suppliers.

Assemblers were becoming more demanding and the imposition of quality and price standards were the principal tools used to pressure first-tier suppliers. Within the logic of global sourcing, assemblers demanded reduced prices, in order to make Brazilian suppliers compatible with international price levels. Assemblers were also demanding quality certified by ISO9000 and QS9000. Price and quality, in addition to historic factors, have accelerated the restructuring of the auto parts industry, with firms either closing down or

migrating into new sectors,[20] becoming second-tier suppliers (as in the case of one of the firms in the research sample), or being acquired by foreign multinational firms (as demonstrated by two of the first-tier suppliers in our sample). These acquisitions have undoubtedly opened the possibility for these firms to participate as exporters to international markets. However, in practice, as seen earlier in this report, exports of Brazilian auto parts were increasingly integrated into regional production schemes, but restricted from the industrialized country markets that had previously comprised the majority of exports.

Acquisition by a multinational producer had nearly become a prerequisite to operate as a first-tier supplier, as contracts often involved "global sourcing" arrangements. These pressures for quality and price, combined with new opportunities for production scale, led two of the first-tier suppliers in the research sample to make new investments in order to increase the range of new products, as well as increase output of existing product lines. The first-tier exhaust pipe supplier adopted a slightly different strategy to increase its participation in the replacement parts market.

Firms installed prior to 1990 in Brazil stated a common view toward future opportunities – to participate in global business after being purchased by a multinational group. The competitive strategies adopted by components suppliers spanned a gamut of activities, ranging from simpler goals such as increasing market share in the replacement market, to more investment-intensive strategies such as installing a factory near a new production site in order to better serve the needs of their assembler clients. Other supplier firms were seeking to increase their participation in product development, an issue explored in section 5.7 of this report.

The range of strategic demands placed upon suppliers, even at the second-tier, were summarized by a firm in the sample:

> "[We must] invest in training, leading-edge technology, high product quality and proximity to clients even in 'industrial condominium' formats, when judged to be in our interest."

5.6 Upgrading capital goods technology

On average, first-tier suppliers in the research sample invested 2-3 per cent of sales in purchases of more sophisticated equipment and in R&D activities. These levels compare poorly with companies in Europe, Japan and the United States that, on average, spend a higher share of sales in their technological activities.

Suppliers of brake systems and car seats reported that the majority of their production machinery was electronically controlled. The exhaust pipes supplier had a more conventional assembly line, replete with mechanical equipment and various soldering processes conducted manually. In general, second-tier suppliers used less sophisticated technology, with the exception of two car-seat suppliers that used a large number of electronically controlled machines.

In general, second-tier suppliers in the research sample used equipment that was over five years old. The same case was found with the first-tier supplier of exhaust pipes. Once again, car seat suppliers – both in the first and second tiers – displayed the most intensive utilization of new and advanced equipment. In contrast to the majority of auto parts

[20] As in the case of one of the "satellite" firms to the exhaust pipe supplier, which invested in diversification of its product line into new markets not linked with the automotive industry, such as the white goods industry.

manufacturers, which typically use discrete metalworking processes, the second-tier supplier of seat foam, for the car seat production chain, used a continuous flow process more similar to the chemical industry (fluid, which must be controlled via electronically monitored equipment, is injected in a process which produces moulded foam). Among companies with more advanced equipment, the most commonly used was computer numerically-controlled machine tools.

5.7 Product technology – Research and development activities

As mentioned earlier, assemblers have moved toward modular design of vehicles, reducing the thousands of separate parts that comprise a vehicle into a few, clearly defined systems, which are sourced to specific suppliers. The global trend has been for vehicle assemblers to pass down the responsibility for the production of component systems, or modules, to their first-tier component suppliers.

It was unclear whether a trend could be identified regarding implications raised for technological development (that is, R&D and design activities) conducted by components manufacturers. As noted earlier, the years of import substitution in Brazil encouraged a process of in-house technological learning among national parts firms. The current trend for components suppliers to become systems or module manufacturers could lead to two potential tendencies. One possible trend could be toward increasing in-house technological capabilities and deepening of the technological skills already developed under import substitution. Such a trend could be considered a continuation of the technological trajectory developed earlier. On the other hand, although the responsibility for first-tier suppliers is to adopt responsibility for the development of designs within the systems logic, the acquisition of components producers and their integration into multinational corporate structures could lead to another path which concentrates design capability in the headquarters overseas.[21] In this latter case, component producers would focus upon their production capabilities and use designs that have been developed elsewhere.

The research findings did not permit us to identify a definite tendency in the industry. The intensity of R&D and design in Brazilian auto parts industry depends largely on the extent to which these activities are conducted in the Brazilian car assembler industry (Salerno et al., 2002). In this sense, since the year 2000, there has been an increase in local product development activities in the car industry – with the local development of (at least part of) new models such as the New Polo and the Fox (a local sub-compact car) by Volkswagen, the Meriva by GM, the New Palio by Fiat and the EcoSport by Ford. These developments have brought significant impacts in the degree of design activities conducted by local auto parts companies as well. There appeared to be pressure for component suppliers to reduce the time of development of new products, following the trend of the vehicles industry to launch new models within smaller periods of time. Nevertheless, it would appear that the technological potential for conducting independent R&D and design was being restricted in the case of all three first-tier firms, as regards research activities and the first stages in the product development process (such as concept definition and product planning).

[21] If a components supplier conducts product development, this theoretically guarantees the right to supply this product to the assembler. However, if final product prices do not conform to the assemblers' expectations, it is possible that even product development does not guarantee the supplying contract. Product prices are now closely monitored internationally, allowing the assembler to negotiate prices worldwide, preventing individual market price differentiation. This may also tend to pull production prices down to the lowest common denominator set by countries with the cheapest labour costs.

The first-tier producer of exhaust pipes demonstrated that the diffusion of advanced process and product technology were not necessarily correlated. This firm used mostly conventional equipment on the shop floor. However, it demonstrated the skills to adapt received designs, as well as completely develop its own designs using in-house engineering capability. The company had a broad product design area that used sophisticated equipment for R&D, the development of prototypes and product testing. The firm stated its intention to provide technological development capability to the assemblers, aiming to develop complete exhaust systems for different vehicle models.

Investment strategies: First-tier and second-tier

It is worth noting that the supplier of car seats reported high-intensity automation not only in designing activities, but also in its information systems and office activities.

A general tendency was observed in the research findings for the first-tier suppliers to concentrate their investments (albeit in widely differing degrees) in product technology. In contrast, investments by second-tier suppliers tended to be in process technology. In this case, second-tier firms (which are not required to conduct advanced product development) concentrated their competitiveness upon achieving the most rational and efficient production flow, in order to supply the specified quantity of parts, with total quality, and low prices.[22] Indeed, first-tier firms relied upon their second-tier suppliers to be manufacturing experts that could solve production problems and meet the technical specifications presented in the product designs.[23]

These tendencies illustrate the response of supplier firms to two major trends in the international automotive industry. The first is the increased role of first-tier firms in the development, manufacture and delivery of systems or modules. The second major trend involves pressure for cost reduction and quality improvement. The responses to these pressures were reflected in the investment strategies adopted by suppliers at both levels of the production chain.

In terms of installed production technology, the first-line suppliers of brake systems and exhaust pipes had a high intensity of automation in their office activities, while they demonstrated medium intensity of automation in their information systems and quality inspection at individual workstations. The brake systems supplier also used medium intensity automation of individual workstations and production sequences. The supplier of exhaust pipes had low intensity automation in workstations and production sequences – however, its production cycles for high-volume products were as low as six minutes on average, often involving a high degree of manual handling of parts and implying high repetitiveness of operations by workers.

The first-tier supplier of car seats reportedly had “state-of-the-art” technology in its plant, according to standards for this product line (as will be seen in the following section). This firm used technology that was of the same generation as most other subsidiaries of the multinational parent company around the world (although reportedly with a lower number

[22] The pressure for price reduction came from assemblers as well as first-tier suppliers. For example, the first-tier brake manufacturer developed a campaign called “Savings Programme” whereby its principle suppliers were encouraged to present alternatives that could contribute toward increasing competitiveness of both firms.

[23] Only in rare cases could second-tier suppliers depend upon their own suppliers for the same conformity to price and quality standards or participation in product design. In most cases, either third-tier suppliers did not have any experience in development of new products, or they were suppliers of raw materials such as steel, rubber or plastic.

of automated controls). For this reason, the company did not need to renovate its installed production equipment. It is noteworthy that the production cycle for this product was reportedly only 28 minutes. This firm reported a medium intensity of automation in quality inspection in workstations, in the equipment in individual workstations and in production sequences.

Suppliers of brake systems and exhaust pipes used technology of a similar generation to advanced international plants in their respective product lines, but on a lower scale. These firms indicated the need to substitute 20 per cent of current installed equipment. Second-tier firms had a tendency to adopt technology of a previous generation, and had longer production cycles that ranged from 10 to 48 hours.

Second-tier suppliers reported using medium-intensity automation in all areas – information systems, designing activities, office activities, quality inspection in workstations, equipment in individual workstations and production sequences.

5.8 Logistics technology: The heart of a new competitive advantage?

The experience of the car seats supplier revealed a significant departure from the conventional dichotomy between product and process technology. In this case, the firm demonstrated the importance of logistics technology as the key to competitiveness. This firm showed that investments in automated technology are vital, especially automated information systems, but only for organizing production flow (not for permitting integration with information systems of the assembler client). As described earlier in this report, the capacity to rely upon sequenced production and delivery of car seats, in two-hour cycles, enabled the assembler to convince this US company to open a subsidiary in Brazil, rather than source from any existing Brazilian seats producer.

This example raises important implications concerning how advanced technology should be introduced on the shop floor in order to achieve greater integration of in-house operations with client operations. It also suggests a shift in favour of logistics technology, over product technology, to be the new heart of competitive advantage for some product lines – even apparently unsophisticated products.

5.9 Quality

A general tendency was identified among first-tier and second-tier suppliers to conduct quality control in a range of areas, namely: the final product; the productive processes; inputs and raw materials; at the beginning and at the end of the line. It was clear that quality had moved from being a differentiating factor between suppliers to become a prerequisite.

ISO9000 certification is essential in this quest to achieve world-class quality, which will enable a supplier firm to keep its clients in the domestic market as well as open new export markets. In fact, it has almost become an "identity card" for companies and appears on their promotional material and in-house documents. In the research sample, all first-tier suppliers had received ISO900 and QS9000 certifications.[24]

[24] QS9000 is a quality certification specifically developed by the US assemblers, seeking to unify what were previously different quality systems, requirements and procedures with suppliers.

It was important to note a "trickle down" effect, with quality practices diffusing throughout the layers of supplier firms, resulting in an upgrading of the entire production chain. Second-tier suppliers were being pressured to obtain certification by their clients. In 1998, two suppliers in the brakes product line already possessed ISO9000 certification, one of which had also obtained QS9000 certification. All suppliers in the car seats product line except one had already attained ISO9000 and had started applying for QS9000 certification. It is significant that none of the suppliers of exhaust pipes had obtained certification and were not even in the process of applying for certification. Second-tier suppliers also demanded product quality certification among their suppliers under the standards of the Brazilian Association of Technical Norms, without necessarily demanding ISO9000 certification, because in many cases they would not even qualify.

In the management of quality and productivity, companies tolerated no more than 2 per cent per million parts produced. The majority of the first-tier and second-tier suppliers acknowledged the importance of the systematic collecting and registering of information concerning production, indicators for evaluating productive and quality targets and written production procedures (which is a requirement for ISO9000). These indicators and procedures generated essential corrective activities for maintaining the regularity and consistency of the productive process. All of the firms in the research sample used permanent mechanisms to identify client requirements and expectations, as well as standardized procedures for meeting client needs. The indicators most commonly used for monitoring compliance with quality and productivity standards are shown in Table 5.1 (in order of importance).

Table 5.1: Indicators for quality and productivity

Indices of scrap, re-work, stock turn-over, output per worker.
Absenteeism, number of accidents, number of suggestions for improvement.
Costs of poor quality, percentage of suppliers with guaranteed quality.
Measurement of defective parts per million, "right the first time" procedures.
Rejected parts per million (RPPM), corrected parts per million (CPPM), parts returned from clients, first-run capability (i.e., capacity to have high-quality output from the start of the production run.
Delivery time (measured in number of days), inventory levels.

All of these indices and quality procedures reveal a clear tendency among most firms to orient their businesses, strategies, methods and production processes and distribution of merchandise increasingly toward serving the needs and demands of their clients. The logic of business strategies has begun to shift from being oriented toward internal procedures to being guided by market requirements. In this new regime, the client is the centre of business strategies, In the same way, client satisfaction is becoming a differentiating factor in the perception of assemblers.

Obstacles to quality

The major difficulties among first-tier and second-tier suppliers in attaining quality standards include: lack of adequate control over process technology; lack of skilled human resources; and the poor quality of nationally produced inputs and raw-materials. For second-tier suppliers, their principal barriers included insufficient economic earnings as a result of lack of access to financing; lack of skilled labour; and lack of cooperation from their suppliers. It is interesting to note that first-tier and second-tier suppliers both mentioned the lack of skilled labour as a problem. However, no evidence was found to suggest that workers were resisting any company policies to reach quality targets. (For an outline of labour-management relations, see section 5.12 of this report.)

None of the companies researched had indicated lack of information about the quality system as a possible difficulty in striving to reach expected quality standards. This finding suggests that the principles of quality systems were already widely used by companies in the research sample, that these principles were part of their repertory and were gradually becoming part of daily practice.

Applying developed-country management techniques in developing countries

All firms in the research sample used just-in-time inventory control, production cells, continuous improvement processes and preventative maintenance. These mechanisms for the control, management and organization of the productive process started being introduced by Brazilian companies in the mid-1980s. By the end of the 1990s, these had been fully adopted by the companies researched. It is significant to note, however, that each company had adopted these notably Japanese practices in their own way, adapted to their own company style and culture. This is consistent with the tendency found by other studies on the automotive industry, which indicate a high degree of local adaptation of imported organizational and management techniques (Fleury and Salerno, 1998; Humphrey, 1995; Posthuma, 1994). This finding suggests that competitive production in developing countries does not involve exact replication of the format of new management techniques transferred from developed countries. Instead, it often applies the core principles and adapts them to local conditions.

Skilling

Workers in the companies researched began to perform new activities which required increased participation and skills acquisition such as: visual inspection; use of measuring instruments for evaluating products and noting the results on the Statistical Process Control (SPC) chart; routine preventative maintenance; participation in groups; capacity to perform different activities; ability to operate more than one machine; and the ability to conduct tool change-over and machine preparation. Machine set-up was less frequently performed by production workers, largely because specialized workers were already assigned to do this.

Just-in-time (JIT)

The JIT approach had been incorporated into the standard philosophy of the companies researched. The first-tier supplier of car seats delivered just-in-time to assemblers, and in turn, received 70 per cent of its own inputs JIT. The first-tier supplier of exhaust pipes used a system based on the concept of a “time-window” where it sent the assembler certain sets of products according to its needs. The system worked satisfactorily, but this company did not receive its inputs JIT from its own suppliers. Only three second-tier suppliers received their inputs JIT. The main obstacles to receiving goods JIT cited by companies included the greater cost of transportation for frequent deliveries and the domestic monopoly in some parts. It was not possible to use JIT for imported products, due to the delay involved in transportation and customs clearances. The failure to fulfill delivery targets forced some companies to increase their reserve stock of raw materials and inputs, as a buffer against production delays.

The modifications introduced in production management since 1996 helped first-tier and second-tier suppliers of car seats and exhaust pipes reduce idle time, lower inventories, improve quality control of products and improve conditions and workplace safety. The first-tier supplier of exhaust pipes also reported reduced environmental pollution and lower wasted materials as a result of these management innovations. First-tier suppliers also

mentioned the labour-saving aspects of this organizational change. The majority of firms reported major changes in production lay-out.

5.10 Inter-firm relations

The type of product line manufactured by the companies involved in this research had some influence upon the type of inter-firm relations established. For example, car seat manufacturing uses a relatively unsophisticated product technology, yet its strong design characteristics and function allow this product to be manufactured with high flexibility, according to the features of each vehicle. Logistics technology was a crucial factor. In comparison, exhaust pipe production involves a low value-added product with low technological sophistication. In this case, close attention to services which can be provided to clients (such as JIT delivery or incorporation into sub-assemblies) as well as maintaining price competitiveness through high economies of scale, were important factors in guaranteeing good relations with assembler clients. In contrast, braking systems involve highly sophisticated product technology and are a key safety feature. The brake supplier interviewed for this research project is one of the most recognized and respected companies in the Brazilian auto parts industry. Founded in the 1960s as a traditional metalworking factory, the firm continued to acquire and master world-class product technology through licensing agreements which led to partial ownership by a leading multinational parts producer, which later purchased the entire company.

It was not uncommon to find second-tier producers that also supply directly to the assembler, which weakens the strict use of the concept of supply networks operating within the supply chain. Nevertheless, the majority of parts from second-tier producers were sold to first-tier firms which supply directly to the assemblers.

"Satellite companies"

It should be mentioned here that the supplier of exhaust pipes had introduced a different relationship with its own suppliers via the concept of "satellite companies". Within this system, the second-tier suppliers had a nearly exclusive sourcing relationship with the first-tier supplier, even though these second-tier firms had begun to diversify their sales in order to break the dependency on the first-tier firm. This is quite consistent with normal practices in the industry – none of the companies researched demanded an exclusive sourcing relationship with its suppliers.

Selecting the supplier

The vehicle assemblers reportedly selected their suppliers on the basis of four fundamental criteria: price; quality; time for delivery; and technological capability. Similar to other tendencies noted earlier in this report – such as the diffusion of production practices throughout the production chain and the shift for first-tier suppliers to become assemblers of components or sub-assemblies for their clients – a common set of behaviour started to characterize the entire production chain. In this case, first-tier and second-tier components producers reported selecting their supplier on the basis of (in order of priority): time for delivery; market recognition; price; and quality. It should be emphasized that, although quality was listed as a criteria, it was already considered a prerequisite for supplier firms.

Contractual relations

Assemblers and suppliers had begun to specify criteria for the calculation of price and the distribution of benefits of increased productivity, minimum time period for presenting

purchasing programmes, quality levels (or the maximum acceptable number of defective parts per million), conditions for delivery frequency and penalties for non-compliance (which could involve extremely high costs for a supplier responsible for stopping the production line). The contract did not include elements such as guaranteed minimum volumes of purchases, penalties if the client did not fulfil the conditions of the contract or conditions that permitted the supplier to rescind the contract before its conclusion. In the case of the suppliers of car seats and braking systems, their contracts included clauses that permitted the client to rescind the contract prior to its conclusion. The timetable for purchases changed frequently, without carrying any penalties for the assembler. In contrast, any possible delays and stoppages of the production line were charged to the responsible supplier.

First-tier suppliers signed partial contracts with their principle suppliers. The car seat industry appeared to possess a more structured contract than the other product lines investigated in this research, including clauses regarding quantitative criteria for the calculation of price; criteria for distribution of benefits arising from increased productivity; minimum time periods for the delivery of purchased goods; guarantees about the minimum volume which can be purchased; penalties if the supplier or the client failed to fulfil their contractual obligations; and conditions which permitted either the supplier or the client to rescind the contract prior to its conclusion.

During the visit to the factory of the car seat supplier, it was possible to verify that this company held inventories for a maximum of three days' production and that the areas for storing finished products and for raw material and inputs were quite limited. Indeed, the company reported a very short production cycle time of only 28 minutes. Clearly, this company required a very finely tuned relationship between its production and the firms in its supplier network. This firm had invested heavily in achieving a just-in-time system for supplying and receiving goods. Operating within a lean production system, and with such a short production cycle, called for a very high degree of commitment and involvement in the assembler-supplier relationship.

This situation was not observed in the case of the supplier of braking systems, which reported using contracts but did not reveal their content. The supplier of exhaust pipes signed contracts with its principle suppliers, but the content was restricted to criteria for calculating costs in order to guarantee overall low prices, criteria regarding the distribution of benefits arising from increased productivity, minimum time periods for the presentation of a purchasing programme and specifications regarding the conditions and frequency of deliveries in order to reduce stocks.

More vulnerable conditions for second-tier suppliers

In general, second-tier suppliers operated under more vulnerable conditions. Many did not even have a supply contract. In cases where they had a contract, they often suffered pressures that are typical in deregulated relations. It was possible to note a rise in the precariousness of inter-firm relations with suppliers, as one descended the production chain in the Brazilian automotive sector.

Second-tier suppliers generally established some contractual relationship with their own suppliers, especially for raw materials. (It is worth remembering that, while these second-tier suppliers tend to be small and medium-sized firms, the suppliers of raw materials are large companies operating on a large production scale. In other words, the second-tier suppliers tended to have contractual relations only with companies with

relatively much greater relative size and negotiating power.)[25] These contracts normally specified the following elements: criteria for calculating prices; minimum time period for the presentation of the purchasing programme; quality standards; maximum acceptable levels of defective parts received; conditions and frequency of delivery; and clauses which permitted the client to rescind the contract prior to its conclusion.

How do supplier firms evaluate the advantages and disadvantages of their contracts?

The producer of braking systems expressed the view that the advantages of contractual relationships depended upon the possibility for the supplier to access global markets, after becoming the principal supplier in its product line for the assembler. Access to international markets enabled this company to keep in touch with trends in the industry and expand its potential opportunities for sourcing goods – thereby attaining economies of scale to compensate for the very tight profit margins specified in its contracts. It is important to note that this firm produced a technologically sophisticated product and core component, implying rigorous standards of product quality and reliability. In the past, this type of firm focused only upon its quality and technological development activities, because profit margins could be negotiated. In contrast, producers of technologically simpler components (such as exhaust pipes) needed to rely upon scale economies in order to maintain profit margins. Given the conditions operating in the world automotive industry, with worldwide systems of component production and distribution, and the globalized corporate structure adopted by the assembly and components industry, the quest for high-scale production has increasingly become a central survival strategy for producers of all component types.

The supplier of exhaust pipes indicated that contracts helped to maintain product quality and price stability (especially during the prolonged periods of macroeconomic instability) and reduced the possibility of losing competitiveness.

The supplier of car seats clearly used highly structured contracts with its clients as well as with its own supply chain:

> "A well-written purchasing contract can guarantee regular supplying, good quality levels, supplying flexibility, shared partnership in the gains and in the administration of problems. A good contract also can guarantee that the contract can be broken if the basic demands of the contract are not being fulfilled. A contract written within these terms generally leaves us feeling secure yet very committed and engaged with our partner. Otherwise, we could go bankrupt."

It is important to consider whether the new type of assembler-supplier relationships in the automobile industry favour more intense interaction between clients and suppliers. The research findings indicate that first-tier suppliers were visited, on average, on a monthly basis by engineers from the assembler. More intensive types of assistance generally occurred only when the supplier requested assistance with a specific problem.

The trend for first-tier suppliers to become assemblers of sub-systems contributed toward upgrading the entire production chain. The first-tier suppliers researched for this

[25] For example, one second-tier supplier reported a situation when its raw material supplier of steel refused to deliver the quantity required (this was during a transitory period of general shortages in steel production). In order to resolve its urgent demand, this second-tier supplier requested the vehicle assembler, at the top of its production chain, to intercede on its behalf. In the end, the vehicle assembler increased its own steel order accordingly and provided the necessary amount of steel to the small supplier firm.

report met frequently with their principal suppliers in order to address issues linked with quality programmes, productivity and cost reduction. More frequent interaction of this type could favour more cooperative relationships between supplier and client firms in the future. This tendency was identified in the supplier of brake systems, which conducted bimonthly meetings with its suppliers, to communicate its targets and future activities. In this way, firms had closer contact, performance expectations were clearer and the possibilities for closer cooperation were promoted. However, this was in the early stage of this new model of inter-firm relations, and perhaps required more intensive interaction in order to transfer and implement new techniques. Whether this intensive interaction will continue in the future depends to a great extent upon the character of the meetings – whether they are unilateral and designed to communicate performance targets, or whether they have a more participatory and interactive nature in which difficulties, new ideas and questions about targets can be posed.

In general, all companies researched have outsourced the areas of food service, cargo transport, cleaning services, medical assistance, guards, security and transport of employees. The areas that were not outsourced included accounting, marketing, staff selection, and informatics services. The principal motives for outsourcing were to focus on the core business and cost reduction. In general, companies did not subcontract any part of the production process, except for the exhaust pipe producer that adopted the concept of satellite companies as a way to reduce costs and raise flexibility. In the evaluation of first-tier suppliers, the subcontracting process was important, and for second-tier suppliers, subcontracting was of moderate importance.

5.11 Human resources management

Changes in labour demand

Employment levels in the Brazilian automotive industry changed dramatically during the 1990s. Competitive pressures arising from market liberalization, changes in the organization of production, the widespread practice of outsourcing services and rising productivity gains all contributed to a significant reduction in the number of direct employees in this industry. As seen earlier in this report, the entire labour force of the assemblers and auto parts producers declined by over one-fourth and by 40 per cent respectively, from 1990 to 2002. At the level of the firm, administrative staff was also reduced. In the past, fluctuations in employment were in response to cyclical oscillations in demand and, consequently, labour shifts always involved production staff. In contrast, more recent changes were deeply structural in nature, and involved changes in procedures and management, including downsizing and a reduction in hierarchical levels of management. The research findings confirmed this tendency, in which firms had cut two levels of management, on average, resulting for the first time in high unemployment among the middle class and professional employees.

Changes in skill requirements

These quantitative reductions clearly involved deep qualitative changes in the demand for labour, skill requirements and organization of the labour process. The research findings revealed important changes in human resources management among the firms examined. The companies had started introducing performance evaluations of their workers. Some firms adopted these new methods in a systematic form, while others were more erratic. All companies using these techniques attempted to evaluate worker performance individually. In some cases, evaluation was conducted at the plant level, involving broader and more generic factors. It is interesting to note the continued practice of evaluating individual performance of workers, despite the increased use of team work and other forms of

integrated tasks, which have changed performance outcomes yet which traditional forms of evaluation are unable to capture. Furthermore, if performance evaluation is aimed toward increasing worker motivation, then more effective indicators need to be developed.

Most first-tier suppliers reported using incentives to increase productivity, reduce absenteeism, meet production targets and improve the productive process. Such practices were not commonly found, however, in the second-tier firms. It should be noted that most of the incentive programmes mentioned were tied to the programme of participation in profits (*Participação nos Lucros e Resultados*) which has been introduced widely in the Brazilian automotive industry, largely as a result of pressure from the trade union movement.

Changes in recruitment practices

Prerequisites for worker recruitment now involve not only technical skills, but also proof of completed basic education. In most cases, completed primary school education was required for workers who would occupy lower positions and conduct simpler, more standardized and repetitive tasks. For positions involving a broader range of activities, taking initiative and decision-making, companies had begun to demand completed secondary school education. In many cases, educational requirements were found to be more important than previous practical work experience in the automotive industry. Companies reported using two methods in the selection of candidates. In general, outside recruitment agencies were contracted to conduct the selection and hiring of workers for simpler posts with higher turnover rates, or for temporary hires. For higher-level positions, selection was conducted by the company's own team.

As seen above, companies were demanding higher-skilled labour and raising the prerequisites for candidates, even for simpler positions. For this reason, it was surprising to see that investments in training employees were quite basic among the companies interviewed. In general, following two days on-the-job and observation of tasks, a production worker was considered capable to start the job. Workers were monitored by leaders or skilled workers while learning to work more autonomously. This monitoring stage lasted up to one month on average. The first-tier supplier of car seats, for example, had adopted an interesting policy of beginning newly-hired workers with a "quality immersion" where they were presented with the fundamental principles of quality philosophy and its tools for one day. The following day, the worker continued to be integrated into the company, after a course that would familiarize the new worker with the firm's product.

Training

Companies ranked training for management, supervisors and machine operators on the shop floor as "important" or "very important". Training for administrative and indirect operational tasks was considered of average importance. The training load varied widely between companies, but it was possible to identify an average of around 60 hours per year for each employee. Training expenditures varied between US$ 500,000 and US$ 600,000 per annum in the supplier of braking systems, between US$ 100,000 and US$ 120,000 in the supplier of exhaust pipes and US$ 140,000 to US$ 250,000 in the producer of car seats. Second-tier suppliers normally invested less in training per annum, except for the satellite firms in the exhaust pipe sector that had no established training policy or activities.

A shift in skilling

The skills required of machine operators, in descending order of importance, were reported as: ability to work in groups; being responsible; the desire to learn new skills;

having notions of mathematics; and ability to take initiative. As can be seen, the skills which Brazilian companies expected of workers have shifted from concrete elements such as mastery of specific techniques to include increasingly other elements of a behavioural nature. It was no longer sufficient for a worker to know how to conduct a specific task and master a set of technical skills. Company responses emphasized the way that each employee works, the attitude towards work, and of relating to colleagues. The ability to work in groups was a new requirement which entirely reverses the previous concepts of fixed workstations, linked with rigid organization of the productive process and of work itself. As flexibility began to embody a part of the daily life of workers, courses which emphasize behavioural skills and those related to working in teams have been taking an increasingly important role in training activities.

Finally, a significant trend was identified in labour use by suppliers in relation to their client firms. The first-tier suppliers of car seats and exhaust pipes reportedly sent 25 and 78 employees, respectively, to work directly in the client's factory. This trend signalled an important step in the direction of closer integration between the assembler and its first-tier suppliers. The logistical integration of production between plants was first stimulated by the introduction of lean production techniques, which emphasized reduced buffer stocks, involved frequent deliveries of parts just-in-time to the shop floor and the geographical location of parts firms in closer proximity to the assembly plant. As another step in this direction, suppliers sent their own employees to supervise the ordering, receiving, handling and use of their products in the assembler's factory. The next step in this process involved the integration of the supplier's production line *inside* the assembly factory.

5.12 Labour-management relations

The relationship between suppliers' workers and their trade unions was perceived by management to have altered significantly in the 1990s. Several responses obtained from management in these firms in the sample illustrate these perceived changes.

> "The tensions between capital and labour have decreased due to the stronger position of the company in areas such as the recent programmes for profit-sharing schemes, the role of rising unemployment and the tendency for unions to be more politically active.
>
> We have an enviable employer-employee relationship, as well as with the workers' representatives, and always have the courses and presentations necessary for maintaining this good relationship. Current labour conflicts are nearly zero.
>
> The company has matured in terms of its labour-management relations. The company has become more open, but without losing the ability to be tough when necessary. For example, with the profit-sharing scheme, the union does not participate in the agreement. If the company follows the law meticulously, then the union does not interfere."

These quotes reveal the view among some managers that had been interviewed that relations have changed to include greater participation of workers and more successful union negotiations. The position of trade unions in general views this change toward presenting proposals, rather than traditional conflict-ridden relations, as having contributed toward closer relations with companies. Meanwhile, it was clear that companies were concerned to delimit how far the participation, or level of influence in the company's decision-making by the union, could go.

It is important to note that these quotes were noted during the course of interviews with management and were not cross-checked for validation neither by workers nor by their trade union representatives. Hence, these comments can only be viewed as a reflection of the perception of management in the interviewed supplies and assembler companies regarding possible changes in labour-management relations.

6. Conclusions

The automotive industry has served as the centrepiece of many Latin American industrialization policies in the 1990s. In Brazil, under protective policies, this industrialization process stimulated a significant technological learning process among local firms, building forward and backward linkages between companies at different stages in the production process. Foreign exchange reserves also benefited, as parts and vehicles ceased to be imported from overseas. Over time, however, prolonged protection of these industries, and insufficient stimuli to improve product quality, update designs and penetrate international markets led to high-cost, low-quality industries.

In the case of the Brazilian automotive industry, market liberalization during the 1990s helped to overcome many of the structural problems of this industry. It has contributed to stimulating increased output, improved quality and productivity and overall modernization throughout the production chain. One could argue that the know-how gained during the establishment, development and expansion of the Brazilian automotive industry enabled the country to achieve a level of integration and manufacturing capability that would prepare it for this new stage in the international automotive industry. In a context where national capital vehicle producers no longer exist and where the industry is increasingly concentrated in the hands of a few multinational producers, Brazil was an attractive location to receive new foreign investments during the mid-1990s. These investments enabled the Brazilian automotive industry to make the transition from being a large, but stagnating, national industry to become a leading production location for Mercosur and selected South American markets as well as export markets such as the NAFTA trading block (especially to the USA and Mexico), Europe and emerging markets such as China.

This insertion into global capital and production flows raises several trends which merit attention, including: vulnerability to fluctuations in demand in regional markets; signs of declining scale of employment and some changes in the employment relationship, in the lower tiers of the production chain; and the future role to be played by local capabilities in technological development in terms of product development and design. As regards this last issue, the launch of new car models partially designed in Brazil in the late 1990s and the early 2000s may signify that concentration of R&D activities in developed countries is not inexorable: depending on the strategy of the companies, the Brazilian automobile industry may play a role as a peripheral design center (for example, being responsible for the development of vehicles destined to emerging countries).

At the international level, the global automotive industry has become highly consolidated in recent years, through mergers and acquisitions between the leading vehicle manufacturers in the world. Following this same trend, the production of automotive components, which was traditionally highly fragmented in literally thousands of companies around the world, is increasingly being concentrated in the hands of several dozen leading conglomerates.

Participation in this global industry requires former national industries to become more “outward looking”. This research suggests that, for the Brazilian automotive industry, the processes of market liberalization, denationalization of parts manufacture and greater insertion in globalized production strategies are impacting upon the types of export markets for Brazilian vehicles. In the case of vehicles, it seems that new market opportunities have opened in Africa and Asia, and that exports to North America have risen substantially, while they have declined to Europe and South America. In the case of auto parts, there seems to be a consolidation of the traditional major export markets in North America and Europe (which account for 67 per cent of total auto parts exports) while South American exports remain limited. It is interesting to note that, although the

logic of regional markets may be an appropriate strategy in various ways for efficient designing and sourcing of manufactured goods, the course of events including the economic crisis, especially in neighbouring countries, has caused problems of over-capacity for companies in Mercosur.

Inter-firm relations have been strengthened on two levels. First of all, relations between assemblers and suppliers have been transformed as assemblers have passed on greater responsibilities to their first-tier suppliers. Assembler-supplier relations were traditionally founded upon price-based competition, where the assemblers would use a broad base of components suppliers to attain greater flexibility in price negotiation and parts acquisition. This logic appears to be changing, with the reduction of the supplier base and reliance upon one or two suppliers to conduct price negotiation, assembly, quality control and just-in-time delivery to the assembly plant.

Second, relations between firms in the supply chain appear to have been strengthened, as first-tier suppliers have become specialized manufacturers, responsible for the effective management of the supply chain and product assembly. This new range of functions includes responsibility for product design, and the assembly of modules which must be delivered directly to the final vehicle assembly line, with the guaranteed quality and cost specified by the assembly client. The research conducted among Brazilian automotive firms also shows that improved manufacturing practices were diffusing throughout the production chain, bringing a virtuous effect of "bootstrapping" (Sabel, 1995) whereby the practices of smaller firms are upgraded via contact with larger companies as a result of these closer inter-firm relations. In some cases, however, the diffusion of new product technology throughout the chain apparently is not so strong, as more sophisticated products (such as electronic ones) are imported from firms located mainly in developed countries. It remains to be seen how the renewed and restructured Brazilian automotive industry will fare in the midst of rapid changes in the global automotive industry.

Bibliography

Addis C.: *Local Models: Auto Parts Firms and Industrialization in Brazil*, PhD dissertation, Massachusetts Institute of Technology, 1993.

Arbix G.: *Uma Aposta no Futuro: os Três Primeiros Anos da Câmara Setorial da Indústria Automobilística*, Editora Scritta, São Paulo, 1996.

Arbix G. and Zilbovicius M.: "O consórcio modular da VW: um novo modelo de produção?", in Arbix, G. and M. Zilbovicius (eds.) *De JK a FHC: a Reinvenção dos Carros*, Editora Scritta, São Paulo, 1997.

Arbix G. and Zilbovicius M.: "Local Adjustment to Globalization: A Comparative Study of Foreign Investment in Two Regions of Brazil: Greater ABC and Greater Porto Alegre", *SEED Working Paper Nº 11*, ILO, Geneva, 2001.

Bedê, M. A.: *A indústria automobilística no Brasil nos anos 90:* proteção efetiva, reestruturação e política industrial. São Paulo 1996, Tese de Doutorado, FEA/USP.

——: A política automotiva nos anos 90. In: Arbix, G.; Zilbovicius, M. (org). *De JK a FHC: a reinvenção dos carros*. São Paulo: Scritta, 1997.

Bresciani P. and Cardoso A.C.M.: "Entre o Fusca e o Mercosul: trabalho e relações industriais na Volkswagen do Brasil", *Report for LEG/REL* – International Labour Office, Geneva, January, 1999.

Calandro M.L.: "A Indústria Automobilística Brasileira: Integraçâo Productiva no Mercosul, Regimes Automotivos e Perspectivas", *Indicadores Econômicos FEE*, Vol. 28, Nº 1, Porto Alegre, July 2000.

Cardoso A. M.: *Trabalhar. Verbo Transitivo: Destinos Profissionais dos Deserdados da Indústria Automobilística*, Editora FGV, Rio de Janeiro, 2000.

Castro N.A.: "Modernização e trabalho no complexo automotivo brasileiro", in Castro, N.A. (ed.) *A Máquina e o Equilibrista: Inovações na Indústria Automobilística Brasileira*, Editora Paz e Terra, São Paulo, 1995.

Conceição J.J., Tadashi Oda N. and Rodrigues Cavignato O.: "General Motors do Brasil: A Borboleta Azul nos Trópicos", *Research report*, São Paulo, February, 1999.

Coutinho L. and J.C. Ferraz (eds.): *Estudo da Competitividade da Indústria Brasileira,* Editora Papirus, Campinas, 1994.

Chudnovsky D. et al.: *Los Límites de la Apertura: Liberalización, Reestruturación y Medio Ambiente,* CENIT/Alianza Editorial, Buenos Aires, 1996.

Dias A.V.C.: *Consórcio modular e condomínio industrial: elementos para análise de novas configurações produtivas na indústria brasileira*, Masters Thesis, Polytechnic School, University of São Paulo, 1998.

DIEESE/Sindicato dos Metalúrgicos da ABC, "General Motors do Brasil", São Bernardo do Campo, 1999.

Fleury A. and Salerno M. S.: "Transfer and hybridization: The construction and diffusion of new models of production in the Brazilian auto industry", in R. Boyer, et al. (eds.) *Between Imitation and Innovation: the Transfer and Hybridization of Production Systems in the International Automobile Industry*, Oxford University Press, Oxford, 1998.

Graziadio, T.: "Some elements of technological changes associated to modular production and supply", 9th GERPISA International Colloquium, *Proceedings*, Paris, 7-9 June 2001.

Humphrey J.: "Industrial reorganization in developing countries: From models to trajectories", *World Development*, Vol. 23, Nº, 1, January 1995.

Humphrey J. and Salerno M.S.: "Globalization and Assembler-Supplier Relations: Brazil and India", *Global Strategies and Local Realities: The Auto Industry in Emerging Markets*, Macmillan Press, London, 2000.

International Labour Office: "The social and labour impact of globalization in the manufacture of transport equipment", Sectoral Activities Programme, Geneva, 2000.

International Metalworkers' Federation: *IMF Auto Report 2000,* Automotive Department, IMF, Geneva, 2000.

Katz J., (ed): *Estabilización Macroeconómica, Reforma Estrutural y Comportamiento Industrial: Estrutura y Funcionamiento del Setor Manufacturero Latinoamericano en los Años 90*, CEPAL/IDRC – Alianza Editorial, Buenos Aires, 1996.

Lee N. and Cason J.: "Automobile Commodity Chains in NICs: A Comparison of South Korea, Mexico and Brazil", in *Commodity Chains and Global Capitalism*, Gereffi G. and M, Korzeniewicz (eds.), Praeger, Westport, 1994.

Leite M.P.: "Restructuração produtiva e sindicatos: o paradoxo da modernidade", in M.O. Leite (ed.) *O Trabalho em Movimento,* Editora Papirus, Campinas, 1997.

Marx R., Zilbovicius M. and Salerno M.S.: "The 'modular consortium' in a new VW truck plant in Brazil: new forms of assembler and supplier relationship", *Integrated Manufacturing Systems*, Vol. 8, No. 5, 1997.

Mericle K.: "The Political Economy of the Brazilian Motor Vehicle Industry", in *The Political Economy of the Latin American Motor Vehicle Industry*, R. Kronish and K. Mericle, MIT Press, Cambridge, 1984.

Posthuma A.: "Japanese production techniques in Brazilian automobile components firms: A best practice model or basis for adaptation?" in T. Elger and C. Smith (eds.) *Global Japanisation*, Routledge, London, 1994.

_____: *Restructuring and Changing Market Conditions in the Brazilian Auto Components Industry*, Economic Commission for Latin America and the Caribbean, Document LC/R 1484, Santiago, January, 1995.

_____: "A Indústria Automobilística Brasileira num Encruzilhado: Modernização Desarticulada e Desnacionalização", in Arbix, G. e M. Zilbovicius (eds.) *JK a FH: Quarenta Anos da Indústria Automobilística Brasileira*, Scritta, Campinas, 1998.

Quadros Carvalho R. et al.: *Abertura comercial e mudança estrutural na indústria automobilística brasileira,* IG/DPCT/Unicamp (mimeo), Campinas, 1997.

Sabel C.: "Bootstrapping Reform: Rebuilding firms, the welfare state and unions", in *Politics and Society*, Winter 1995.

Salerno, M. et al.: *A nova configuração da cadeia automotiva brasileira*, Relatório de Pesquisa, Departamento de Engenharia de Produção, Escola Politécnica da USP, São Paulo, 2002.

Salerno M., M. Zilbovicius, G. Arbix and A.V.C. Dias: "Mudanças e persistências no padrão de relaçoes entre montadoras e autopeças no Brasil", *Revista de Administração da USP*, Vol. 33, No. 3, July/September, São Paulo, 1998.

Salerno M. and Zilbovicius M.: "VW plant at Resende inaugurated", *La Lettre du Gerpisa*, No. 109, Paris, January, 1997.

Shapiro H.: *Engines of Growth: The State and Transnational Auto Companies in Brazil*, Cambridge University Press, Cambridge, 1994.

UNCTAD: *World Investment Report 2000, Cross-Border Mergers and Acquisitions and Development*, Geneva, 2000.

Periodicals and statistical sources consulted:

Autodata, São Paulo (various numbers)

Automotive News, Detroit

ANFAVEA, Statistical Yearbook, São Paulo, various years

The Economist

The Financial Times

Gazeta Mercantil, São Paulo

JETRO (various publications and studies)

Neue Zürcher Zeitung

Organisation Internationale des Constructeurs d'Automobiles (OICA) (www.oica.net)

Sindipeças, Statistical Yearbook, São Paulo, various years

SEED Working Papers

1. "Home Work in Selected Latin American Countries: A Comparative Overview" *(Series on Homeworkers in the Global Economy)*, Manuela Tomei, 2000
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15. "Jobs, Gender and Small Enterprises: Getting the Policy Environment Right" *(Series on Women's Entrepreneurship Development and Gender in Enterprises — WEDGE)*, Linda Mayoux, 2001
16. "Regions, Regional Institutions and Regional Development" *(Series on Globalization, Area-based Enterprise Development and Employment)*, Maarten Keune, 2001
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18. "Jobs, Gender and Small Enterprises in Africa and Asia: Lessons drawn from Bangladesh, the Philippines, Tunisia and Zimbabwe" *(Series on Women's Entrepreneurship Development and Gender in Enterprises — WEDGE)*, Pamela Nichols Marcucci, 2001

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20. "Jobs, Gender and Small Enterprises in Bulgaria" *(Series on Women's Entrepreneurship Development and Gender in Enterprises — WEDGE)*, Antonina Stoyanovska, 2001

21. "Women Entrepreneurs in Albania" *(Series on Women's Entrepreneurship Development and Gender in Enterprises — WEDGE)*, Mimoza Bezhani, 2001

22. "Ajuste Local à Globalização: um estudo comparativo do investimento estrangeiro direto no ABC e na Grande Porto Alegre" (*Série sobre Globalização, Desenvolvimento de Empresas ao Nível Local e Emprego)*, Glauco Arbix, Mauro Zilbovicius, 2002

23. "Small Enterprises, Big Challenges: A Literature Review on the Impact of the Policy Environment on the Creation and Improvement of Jobs within Small Enterprises", *(Series on Conducive Policy Environment for Small Enterprise Employment)*, Gerhard Reinecke, 2002

24. "Méthodes et Instruments d'Appui au Secteur Informel en Afrique Francophone", Carlos Maldonado, Anne-Lise Miélot, Cheikh Badiane, 2004

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27F. "Une révolution de l'information pour les petites entreprises en Afrique : L'expérience en matière de formats radio interactifs en Afrique" *(Série Innovation et viabilité des services d'appui aux entreprises)*, Mary McVay, 2002

28. "Assessing Markets for Business Development Services: What have we learned so far?" *(Series on Innovation and Sustainability in Business Support Services (FIT)),* Alexandra Overy Miehlbradt, 2002

29. "Creating a Conducive Policy Environment for Micro, Small and Medium-Sized Enterprises in Pakistan" *(Series on Conducive Policy Environment for Small Enterprise Employment)*, Small and Medium Enterprise Development Authority of Pakistan (SMEDA), 2002

30. "Creating Market Opportunities for Small Enterprises: Experiences of the Fair Trade Movement", Andy Redfern and Paul Snedker, 2002

31. "Creating a Conducive Policy Environment for Employment Creation in Small Enterprises in Viet Nam" *(Series on Conducive Policy Environment for Small Enterprise Employment)*, Pham Thi Thu Hang, 2002

32. "Business Training Markets for Small Enterprises in Developing Countries: What do we know so far about the potential?" *(Series on Innovation and Sustainability in Business Support Services (FIT))*, Akiko Suzuki, 2002

33. "Organizing Workers in Small Enterprises: The Experience of the Southern African Clothing and Textile Workers' Union" *(Series on Representation and Organization Building)*, Mark Bennett, 2002

34. "Protecting Workers in Micro and Small Enterprises: Can Trade Unions Make a Difference? A Case Study of the Bakery and Confectionery Sub-sector in Kenya" (*Series on Representation and Organization Building)*, Gregg J. Bekko and George M. Muchai, 2002

35. "Creating a Conducive Policy Environment for Employment Creation in SMMEs in South Africa" *(Series on Conducive Policy Environment for Small Enterprise Employment)*, Jennifer Mollentz, 2002

36. "Organizing in the Informal Economy: A Case Study of Street Trading in South Africa" (*Series on Representation and Organization Building)* Shirin Motala, 2002

37. "Organizing in the Informal Economy: A Case Study of the Clothing Industry in South Africa" (*Series on Representation and Organization Building)*, Mark Bennett, 2003

38. "Organizing in the Informal Economy: A Case Study of the Building Industry in South Africa" (*Series on Representation and Organization Building)*, Tanya Goldman, 2003

39. "Organizing in the Informal Economy: A Case Study of the Minibus Taxi Industry in South Africa" (*Series on Representation and Organization Building)*, Jane Barrett, 2003

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