



# INTERNATIONALIZATION AND GEOGRAPHICAL RELOCATION OF BRAZIL'S AUTO-PARTS INDUSTRY

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*The goal of this paper is to analyze the process of denationalization and geographical relocation of Brazil's auto-parts industry. A survey of data provided by industry associations and specialized publications and information from the authors' previous research projects were employed to analyze the relationship between automakers and their suppliers. It is possible to attest that Brazil's auto-parts industry has undergone a process of denationalization in the wake of its international reorganization, which has led to its being included in discussions about the deindustrialization phenomenon. The demands placed by automakers, coupled with the ease of importing auto-parts, have hampered the operations of domestic-capital companies in this sector, which has caused many of them to be acquired by multinationals. At the same time, it has been observed the entry of new investments from automakers, from both those established decades ago and more recent ones, which have installed new plants in regions with little or no background in auto-making. This has concurred to a shift in the geographic location of this industry in Brazil, closely followed by that of the auto-parts business.*

*Keywords: Internationalization, relocation, auto-parts, supply chain.*

## 1 Introduction

The goal of this paper is to analyze the process of denationalization and geographical relocation of Brazil's auto-parts industry, which has led to significant changes in production management and in the relationship between companies.

In recent decades, the auto-parts industry in Brazil has undergone a process of denationalization and is among the sectors mentioned in discussions about deindustrialization, which prompted the government to announce, in 2012, measures to relieve payroll tax burden for 15 sectors, including that of auto-parts (Barros, 2011; DIEESE, 2011; Mazzi, 2012).

Denationalization was a consequence of the international reorganization of this industry, which was observed in other sectors as well. However, in this case, this process was also affected by the relationship between automakers and their suppliers. The demands placed by automakers and the facility to import auto-parts hampered the performance of Brazilian-capital auto-parts manufacturers, which were eventually acquired by multinationals. At the same time, there were new investments on the part of automakers, both those that had been in the country for decades and more recent ones. This concurred to a shift in the geographic location of this sector, followed shortly afterward by that of auto-parts.

In order to write this article, an analysis was conducted on data from industry associations, e.g., SINDIPEÇAS (National Union of Auto-Parts Manufacturers) and ANFAVEA (National Association of Automakers), and on data found in mainstream press, specialized media, and webpages of the companies in question. Information from the authors' own research in more recently established plants that employ novel relationship practices with their suppliers was also analyzed. Interviews were conducted at these companies with production, logistics, and quality managers and directors about the relationship between companies, automakers' demands, and resulting changes.

Firstly, this text explores the relationship between auto-parts suppliers and automakers and their demands, which has led to the international concentration in the auto-parts industry. Then, data are presented on how this process has occurred in Brazil's industry; it appears that this sector has undergone denationalization in tandem with geographical relocation.

## 2 Relationship between Companies in the Automaker Sector

In Japan, according to Womack et al. (1992), there is cooperation as well as lasting relationships between companies and suppliers, joint development of projects, and integration between methodologies and processes. There, cost reduction and continuous improvement projects transcend company borders and involve supply chains. Moreover, there is just-in-time supply.

This kind of relationship began to influence Western automakers from the 1990s onwards, which began to reorganize their purchase process, created specialized units for the selection and development of suppliers, and began to require that their suppliers adopt an array of lean production management methods. At the same time, several activities were outsourced. European and, especially, U.S. automakers began to focus their attention on the design, assembly, distribution as well as the manufacturing of components involving strategic technologies or those with high logistics costs, e.g., engines, transmission, and heavy stamping, and outsourced the remaining activities (Costa, 1998; Santos & Pinhão, 2000).

Automakers also sought to identify key suppliers and consolidate them as first-tier suppliers and adopted single suppliers for their major components. These suppliers were engaged in the development of an automobile from the very beginning: its project, and were generally

expected to establish production plants at all the places where it was produced, a strategy known as “follow sourcing.” On the whole, this strategy has been applied to bulky, difficult-to-transport components, high storage-cost components, and intermediate components, thereby favoring the development of regionalized supply networks. Cost reduction, improvement, and development goals have been set for these suppliers (Santos & Pinhão, 2000; Calandro, 1995).

For minor components, automakers have often adopted the “global sourcing” strategy, by which they seek suppliers that meet their quality requirements and, through global quotes, obtain the lowest prices and economies of scale (Costa, 1998). This has been mainly applied to low storage-cost and easy-to-transport components. This strategy allows automakers to reduce development costs in that they can opt for manufacturers that already produce the auto-parts they need and pressure local manufacturers to reduce their profit margins to compete in the international marketplace (Salerno et al., 1998).

These strategies have changed the competitive base of the auto-parts sector, which now requires that manufacturers acquire skills to develop and supply complete systems worldwide and offer a broad mix of competitively-priced quality products (Santos & Pinhão, 2000).

Because of new requirements in terms of scale, financial, geographical, and technological capacity, there has been a gradual reduction in the number of auto-parts companies. The companies that were unable to adapt had to diversify, i.e., direct their activities to other sectors, or underwent mergers and acquisitions or were simply driven out of business. The financial capacity of most small and midsize Brazilian companies was insufficient to operate in this new scenario (Costa, 1998).

In the late 1990s, some segments came to be controlled by a few globally-based “mega-suppliers” (Santos & Pinhão, 2000). Table 1 lists the 50 largest multinational auto-parts manufacturers, considering the 2010-sales criterion. Countries with greater participation are Japan with 18 companies, the United States with 11, and Germany with 9.

Table 1: The top 50 suppliers to automakers (2010).

Rank 2010	Company	Country of origin	Sales (US\$ milion)	Rank 2009	Rank 2008
1	Robert Bosch	Germany	34,565	2	1
2	Denso	Japan	32,850	1	2
3	Continental	Germany	24,819	4	3
4	Aisin Seiki	Japan	24,613	3	5
5	Magna international	Canada	23,600	5	4
6	Faurecia	France	18,220	7	8
7	Johnson Controls	USA	16,600	8	6
8	ZF Friedrichshafen	Germany	15,748	10	9
9	LG Chem	South Korea	15,500	6	-
10	Hyundai Mobis	South Korea	14,433	12	19
11	TRW Automotive	USA	14,400	11	10
12	Delphi Holding	USA	13,817	9	7
13	Yazaki	Japan	12,531	16	14
14	Lear	USA	11,955	15	11
15	Sumitomo Electric Industries	Japan	11,228	17	17
16	BASF	Germany	10,400	18	53
16	Toyota Boshoku	Japan	10,400	14	12
18	CalsonicKansei	Japan	8,775	22	25
19	JTEKT	Japan	8,285	23	22
20	Hitachi Automotive Systems	Japan	8,011	19	27
21	Valeo	France	7,952	13	15
22	Visteon	USA	7,320	21	18
23	Autoliv	Sweden	7,171	28	28
24	Magneti Marelli	Italy	6,754	24	23
25	Mahle	Germany	6,628	25	29

26	Benteler Automobiltechnik	Germany	6,365	20	16
27	Dana Holding	USA	6,109	26	20
28	Toyoda Gosei	Japan	6,000	27	31
29	Cummins	USA	5,846	29	26
30	DuPont	USA	5,671	35	38
31	BorgWarner	USA	5,653	36	32
32	Schaeffler	Germany	5,400	38	21
33	NTN	Japan	5,297	51	57
34	NSK	Japan	5,279	34	47
35	Mitsubishi Electric	Japan	5,265	50	44
36	Tenneco	USA	4,768	41	35
37	Behr	Germany	4,630	39	34
38	Brose	Germany	4,609	42	43
39	NHK Spring	Japan	4,519	31	45
40	Koito Manufacturing	Japan	4,390	33	37
41	TS Tech	Japan	4,185	32	50
42	Plastic Omnium	France	4,180	59	72
43	Takata	Japan	4,106	37	33
44	Federal Mogul	USA	3,892	47	41
45	Hyundai WIA	South Korea	3,827	65	-
46	Bridgestone / Firestone	Japan	3,809	43	35
47	Michelin	France	3,753	40	40
48	IAC	Luxembourg	3,700	45	39
49	Tokai Rika	Japan	3,690	44	51
50	GKN Driveline	United Kingdom	3,650	53	42

Source: Based on Automotive News (2010, 2011).

Below are presented the consequences of this concentration to Brazil's auto-parts industry.

### 3 Rearrangement of Brazil's Auto-Parts Industry

The follow-sourcing strategy proved to be unfeasible to Brazilian auto-parts manufacturers due to the need for high investments. Most of these businesses could not fit as first-tier suppliers and, as a result, were either demoted to a second tier or acquired by global companies, which promoted a process of concentration and denationalization in this sector (Costa, 1998; Robles, 2001; Salerno et al., 1998). In the late 1990s, even large Brazilian auto-parts manufacturers were eventually acquired by multinational corporations, as shown in Table 2.

Table 2: Brazilian auto-parts manufacturers acquired by multinational companies

Acquired Company	Year of Establishment	Products	Year of Acquisition	Acquiring Company	Country of Origin
Metal Leve	1950	Pistons, Bearings, Washers and Bushings	1996	Mahle	Germany
Cofap	1951	Dumpers	1997	Magneti Marelli	Italy
Borlem	1968	Wheels	1998	Hayes Lemmerz / Maxion Wheels	USA / Brazil
Freios Vargas	1945	Brakers	1999	TRW	USA
Cobreq	1961	Brake Linings and Brake Pads	2001	TMD Friction / Nisshinbo Brake	Luxembourg / Japan

Source: Based on press releases and information found on the companies' webpages.

In some cases, the technological center of the acquired company was maintained due to existing skills, as was the case of Cofap. In most cases, however, the acquired auto-parts businesses became subsidiaries dependent on their acquiring companies with no possibility of locally developing technologies and innovations, since research and development began to be mostly conducted at their headquarters (Moreira & Correia, 1996).

These changes have strengthened the presence of large global companies in Brazil. Only eight of the 50 largest multinational auto-parts companies shown in Table 1 do not have production plants in Brazil: CalsonicKansei, Hitachi, Toyota Gosei, NTN, Mitsubishi Electric, and Koito Manufacturing, all of Japanese origin, South Korea’s Hyundai, and Luxembourg’s IAC. Many of these 50 companies have plants in other South American countries as well.

Nevertheless, there are cases of companies that still resist and remain controlled by Brazilian capital. They operate as first-tier suppliers to automakers, and in some cases, have expanded their activities globally (Costa, 1998). Table 3 shows some of these cases.

Table 3: Brazilian-capital auto-parts manufacturers, products and locations in 2011

Company	Year of Establishment - Location	Products	Location of Plants
Arteb	1934 - São Paulo	Lighting Systems	São Bernardo dos Campos (SP), Diadema (SP), Gravataí (RS), Camaçari (BA)
DHB Componentes Mangel	1967 - Rio Grande do Sul	Steering Systems	Porto Alegre (RS), EUA, Argentina
lochpe Maxion	1928 - São Paulo	Steel, Aluminum, and Rolled Steel Wheels	São Paulo (SP), São Bernardo dos Campos (SP), Três Corações (MG), Manaus (AM)
Metagal	1918 - Rio Grande do Sul	Wheels and Chassis	Cruzeiro (SP), Limeira (SP), Contagem (MG), Hortolândia (SP), China, México
Sabó	1935 - Diadema (SP)	Internal and External Mirrors	Santa Rita do Sapucaí (MG), Conceição dos Ouros (MG), Diadema (SP), São José dos Pinhais (PR), Manaus (AM), Argentina
	1939 - São Paulo	Sealing Components	São Paulo (SP), Mogi Mirim (SP), Argentina, Alemanha, Áustria, Hungria, China, EUA

Source: ANPEI (2007) and companies’ webpages.

Changes in composition of capital in Brazil’s auto-parts sector in the last decades are shown in Figure 1.

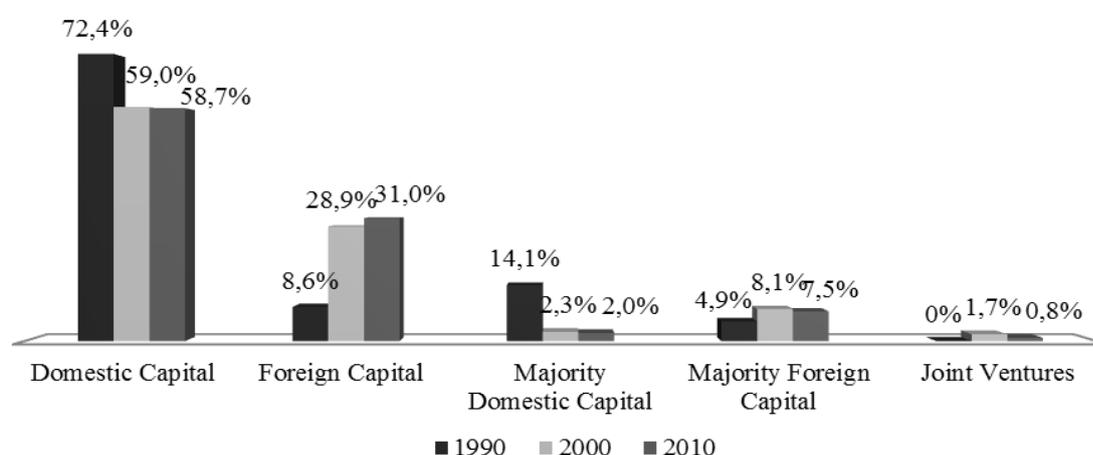


Figure 1: Composition of capital of auto-parts sector in Brazil in 1990, 1999, and 2009

Source: Based on SINDIPEÇAS (2010).

In addition to acquisitions, these changes are also due to the creation of joint ventures and the establishment of subsidiaries of foreign companies in Brazil. It may be observed that the participation of foreign capital grew at a slower pace in the 2000s as compared to the previous decade.

This change in the composition of capital was to some extent encouraged by industrial policies favoring automakers, e.g., low tariffs on imported auto-parts and relaxation of nationalization requirements, exacerbated by an overvalued exchange rate. Local businesses were also affected by high interest rates, which hindered access to domestic capital, high

taxes, poor infrastructure, and excessive bureaucracy (Bedê, 1997; DIEESE, 2011; Gonçalves, 2006).

This situation has continued in recent years, fueling demonstrations against “deindustrialization,” defined by Barros (2011) as the structural reduction of participation of industry in GDP [gross domestic product] as a function of growth in imports. Also according to Barros (2011), this has benefited automakers, which can still rely on protectionist policies for automobiles, and has harmed the auto-parts sector, tipping the trade balance negatively, as can be seen in Figure 2.

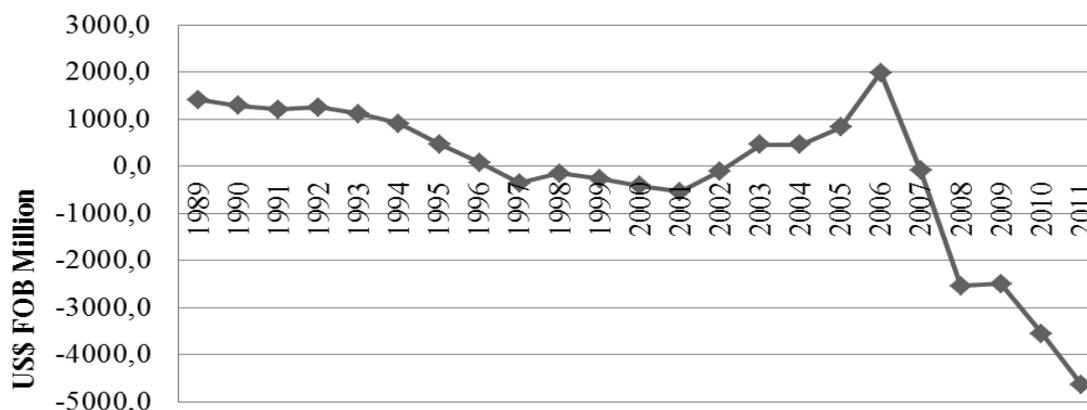


Figure 2: Trade balance in Brazil’s auto-parts sector from 1989 to 2009

Source: Based on SINDIPEÇAS (2010).

In order to promote industrial advancement, Brazil’s government announced measures to reduce payroll taxes in April 2012, e.g., the INSS (National Social Security Institute) tax from 20% of a company’s payroll value to something between 1% and 2.5% of its revenue and to exempt exports from this tax. One of the 15 sectors benefited by this measure was that of auto-parts. The government also announced specific measures for the automotive sector, aiming to encourage technological development, increase the number of domestic components in automobiles, and hence reduce the volume of imports (Lima et al., 2012; Marquez, 2012; Silva, 2012; UOL, 2012).

At the same time, auto-parts manufacturers have followed the geographic relocation of automakers, as discussed below.

#### 4 Geographic Relocation of Automakers and Auto-Parts Manufacturers

São Paulo State (SP) was the first Brazilian region to receive automakers. Greater São Paulo City and the so-called ABCD Paulista (the surrounding cities of Santo André, São Bernardo, São Caetano, and Diadema) became the traditional hub of auto industry in the country. Then, in the 1970s, the establishment of Fiat in Betim, State of Minas Gerais (MG) drew hundreds of auto-parts manufacturers (FIAT, 2010). The late 1990s and the 2000s were marked by the entry of new automakers and by the process of previously established automakers relocating their investments, moving their activities to regions with little or no background in this industry, e.g., the South, Northeast, Midwest, upstate São Paulo, and State of Rio de Janeiro (Zawislak et al., 1998). Table 4 presents a chronology of automakers’ investments until 2011. Two other companies have announced their intention to produce in Brazil: China’s JAC Motors, which intensified its entry into the country via imports in 2011 (JAC Motors, 2011; Brandt, 2011), and Rossi-Bertin, a Russian maker of luxury cars (Diário Catarinense, 2010).

Table 4: Geographic distribution of automakers in Brazil

Location	Year of Establishment	Automaker	Location of Plants	Production per Year	Capacity	Number of Jobs
São Paulo City and ABCD	1930	GM	São Caetano do Sul - SP	280.000		21.700
	1953	Daimler Chrysler	São Bernardo - SP	75.000		13.000
	1958	GM	São José dos Campos - SP	230.000		
	1959	Volkswagen / Audi	São Bernardo - SP	1.600 (per day)		23.000
	1959	Toyota	São Bernardo - SP	(Closed)		3.200
	1962	Scania	São Bernardo - SP	20.000		3.000
	1967	Ford	São Bernardo - SP	200.000		4.500
	1998	Land Rover	São Bernardo - SP	-		-
São Paulo State	1976	Volkswagen / Audi	Taubaté - SP	1.000 u/d		
	1979	Daimler Chrysler	Campinas - SP	(Closed)		-
	1997	Honda	Sumaré - SP	650 (per day)		3.400
	1998	Toyota	Indaiatuba - SP	80.00		
	2012	Toyota	Sorocaba - SP	70.000		1.500
	2013*	Hyundai	Piracicaba- SP	150.000*		(7.000*)
	2015*	Chery	Jacareí - SP	-		
Minas Gerais State	1976	Fiat	Betim - MG	800.000		25.000***
	1999	Daimler Chrysler	Juiz de Fora - MG	70.000		1.100
	2000	Fiat / Iveco	Sete Lagoas - MG	20.000		2.600
Rio de Janeiro State	1996	Volkswagen / Audi	Rezende - RJ**	175 (per day)		
	2001	PSA Peugeot Citroën	Porto Real - RJ	160.000		3.000
South	1975	Volvo	Curitiba - PR	110 (per day)		2.300
	1965	Agrale	Caxias do Sul - RS	-		-
	1998	International	Caxias do Sul - RS	-		-
	1999	Volkswagen / Audi	São José dos Pinhais - PR	810 (per day)		
	2000	GM	Gravataí - RS	230.000		
	2000	Renault / Nissan	São José dos Pinhais - PR	200.000		5.000
Midwest	1998	Mitsubishi	Catalão - GO	28.000		1.700
	2007	Hyundai / CAO	Anápolis - GO	60.000		2.800
Northeast	1995	Troller	Horizonte - CE	6,5 (per day)		-
	2001	Ford	Camaçari - BA	250.000		8.000
	2014*	Fiat	Porto de Suape - PE	200.000 *		(3.500*)

\* Estimate.

\*\* Trucks and Buses/Modular Consortium.

\*\*\* Direct and Indirect Jobs/These automakers made use of imported kits, i.e., they just assembled their automobiles in Brazil.

Source: The corresponding companies' webpages.

There seems to be a tendency for geographical decentralization of automakers, under the justification of lower costs, more availability of land and workforce, and better relationship with unions. At the same time, the North, Midwest, and Northeast have benefited from tax incentives (Receita Federal, 1997, 2010, 2011). In addition, the North has also benefited from the presence of the free trade zone in Manaus (AM), where India's Mahindra is located.

This change in location of automakers affects the location of auto-parts manufacturers in that automakers require that plants of a considerable part of their first-tier suppliers be located nearby (Arbix & Zibovicus, 1997; Zawislak et al., 1998). Sometimes, this requirement has led to the construction of industrial condominiums or modular consortiums. This is the case of

Volkswagen in Resende (RJ), which has drawn major suppliers to its vicinity. Table 5 lists Brazil's major industrial condominiums. Other industrial condominiums are being planned for Fiat in Pernambuco and Toyota and Hyundai in upstate São Paulo.

Table 5: Major industrial condominiums in Brazil (2012)

Automaker	Location	Number of Tenants
General Motors	Gravataí – RS	17
Ford	Camaçari- BA	27
PSA Peugeot Citroën	Porto Real – RJ	-
Volkswagen	São José dos Pinhais – PR	14

Source: Based on Najberg & Puga (2012) and the companies' webpages.

In spite of relocation, the highest concentration of auto-parts manufacturers is still found in São Paulo State, as shown in Table 6.

Table 6: Geographic distribution of auto-parts manufacturers in Brazil from 1991 to 2010

Region	State	1991	1995	2000	2005	2010
Southeast	São Paulo	90,7%	86,7%	76,8%	71,6%	67,0%
	Minas Gerais	-	-	8,3%	9,8%	8,9%
	Rio de Janeiro	-	-	1,3%	1,8%	2,3%
Southeast Total		90,7%	86,7%	86,4%	83,2%	78,2%
South	Paraná	-	-	5,0%	4,9%	5,5%
	Rio Grande do Sul	-	-	4,6%	5,1%	6,5%
	Santa Catarina	-	-	2,3%	2,6%	3,9%
South Total		-	-	11,9%	12,6%	15,9%
Northeast	Bahia	-	-	0,2%	2,5%	3,0%
	Ceará	-	-	0,3%	0,2%	0,2%
	Pernambuco	-	-	0,8%	0,8%	0,8%
Northeast Total		-	-	1,3%	3,5%	4,0%
Midwest	Goiás	-	-	0,3%	0,2%	0,2%
Northeast	Amazonas	-	-	0,3%	0,6%	1,3%

Source: Based on SINDIPEÇAS (1997, 2011).

Table 7 shows the distribution of auto-parts manufacturers in São Paulo State.

Table 7: Geographic distribution of auto-parts makers in São Paulo State from 1991 to 2010

Region	1991	1995	2000	2005	2010
ABCD	18,4%	18,2%	15,5%	14,3%	10,5%
São Paulo City	38,9%	33,6%	22,8%	18,2%	8,2%
Upstate São Paulo	17,2%	19,0%	21,5%	23,7%	34,7%
Greater São Paulo City	16,2%	15,9%	17,0%	15,4%	13,6%
Other States	9,3%	13,3%	23,4%	28,5%	32,6%

Source: Based on SINDIPEÇAS (1997, 2011).

There has been a decrease in the number of auto-parts manufacturers in Greater São Paulo City and ABCD whereas it has increased upstate, which has become the region with the largest number of auto-parts manufacturers in Brazil.

Despite ongoing debate about deindustrialization, auto-parts manufacturers have announced several investments in Brazil.

## 5 Conclusion

The integration of data from different sources, in addition to those from the authors' own research in the sector, has provided a broader view of the situation of the auto-parts industry in Brazil. There has been observed a growth of global mega-suppliers and their entry in the Brazilian market. This growth was influenced by strategies adopted by automakers, e.g., follow sourcing and global sourcing, and these companies' interest in South America. These strategies have led many domestic companies in the automotive sector to be sold to multinationals or driven them out of business. Other factors that influenced denationalization were lower import tariffs on auto-parts, an overvalued exchange rate, and high interest and taxes.

Some economists have recently begun to discuss the process of de-industrialization; however, there is no consensus about the occurrence of this process in Brazil. The growing volume of imported automotive components is often presented as evidence of this process. In light of this situation, the government has announced measures to counter this process, such as payroll tax exemptions for 15 sectors, including that of auto-parts, and a new automotive program to promote the domestic production of auto-parts.

Another significant change observed was the geographical relocation of automakers and, subsequently, auto-parts manufacturers. The interior of São Paulo State has become the main focus of attraction. There have also been investments in the South and Northeast, the states of Minas Gerais and Rio de Janeiro. The presence of large companies in regions with little or no background in this industry may favor the transfer of resources, e.g., technical expertise, equipment, capital, management skills, and skilled workers, and access to markets.

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