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Hierarchical clusters: emergence and take-off of the automotive districts of Barcelona and São Paulo

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The origins of modern economic growth are closely related to the success of industrialization.[1] The latecomers endeavoured to emulate the first-movers, applying and adapting their production methods and industrial organization. At the time of the second industrial revolution, the automobile industry played a decisive role, its backward linkages favouring the promotion of a broad spectrum of manufacturing activities, a situation highlighted by prominent business historians.[2] The introduction of the motor industry was a strategic objective for many countries which wanted to industrialize.[3]

The aim of this work is to compare the evolution of the automobile clusters of Barcelona and São Paulo, from when they were formed until they both moved beyond their infant industry phase at the beginning of the 1970s.[4] The two metropolitan regions

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[1] Toynbee, *Lectures*; Rostow, *Stages*; Gerschenkron, *Economic*; Landes, *Unbound*; Pollard, *Peaceful*; Bairoch, "International Industrialization Levels," 269-333; Mokyr, *British*; and Allen, *British*.

[2] Chandler, *Giant*; Wilkins and Hill, *American*; Wilkins, *Maturing*; Landes, *Dynasties*; Abramovitz, "Catching up," 385-406; and Klepper, "The Capabilities of New Firms," 645-666.

[3] Amsden, *Asia's*; Shapiro, "Determinants of Firm Entry," 876-947; Chang, "The Political Economy," 131-157; Jenkins, "The political economy," 625-645; and Lin and Chang, "Should Industrial Policy," 483-502.

[4] Following Porter, "Locations, Competition and Economic Development," 16, we consider a cluster to be a "*geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities.*" The Barcelona cluster includes the companies and

considered represent cases of relatively early industrial development in developing countries. Although the industrial revolution failed overall in Spain, Catalonia was an example of early industrialization in southern Europe.[5] In a similar manner, São Paulo stood out as one of the few industrial systems of the southern hemisphere.[6] In both cases, the triumph of the manufacturing system was preceded by several decades of accumulation of capital and the formation of business capabilities associated with the exporting of primary goods with a highly inelastic demand: wine-sector products, where Catalan agriculture had been dominant since the 18th century; and coffee, promoting São Paulo state in the 19th century. The exchange of wine-based products continued to favour the conversion of Barcelona into the main cotton spinning centre of Mediterranean Europe throughout the 1800s. In the capital of São Paulo, the industrialization process took off at the end of the century, stimulated by the abolition of slavery in 1888, the reinvestment of profits from coffee exports and the search for alternative domestic supplies by importers. The Great War strengthened the import substitution process and, during the 1920s, São Paulo experienced spectacular industrial growth favoured by the climax achieved in coffee exports.

The automobile industry reached important milestones in the hinterlands of both cities at the beginning of the 20th century, although not of sufficient size to make them comparable with the indisputable automobile districts of Michigan, the West Midlands, Île de France and subalpine Italy. The triumph of automobile manufacturing in the

institutions located in its province. That of São Paulo includes the capital of the state of the same name plus the areas around the Anchieta highway, which links the city with the Port of Santos, and around the Dutra highway, which connects it with Rio de Janeiro, up to São José dos Campos, 85 kilometres from the centre.

[5] Vicens, *Industrials*; Vilar, *Catalogne*; Nadal, *fracaso*; and Valls, *Catalunya*; Nadal et al., *Atles*.

[6] Furtado, *Formação*; Dean, *Industrialization*; and Cano, *Raizes*.

Barcelona and São Paulo clusters was not clear until the 1970s, when both districts already stood out as prominent automobile construction centres in Mediterranean Europe and tropical America. At present, while the motor industry has undergone a considerable downfall in pioneering locations such as Detroit, Coventry, Paris and Turin, its health is relatively robust in the São Paulo and Barcelona clusters.

This work intends to analyze the keys to the process that converted these two cities into important capitals in the motor world of the Mediterranean and of the southern hemisphere. The auto industry played a key role in the industrialization of Brazil and Spain. In both countries, this industry experienced a considerably regional concentration during the first three quarters of the 20th century. It is no accident that, in 1974, São Paulo accounted for more than 90% of all vehicles manufactured in Brazil, while Barcelona was responsible for almost 50% of those produced in Spain. We explore four possible factors explaining the relative success attained in both regions: the presence of external economies; the capacities provided by hub companies; the adoption of national government strategic industrial policies; and the emergence of adequate local institutions. The research aims to consider the importance of each of these factors in the decisive phases which enabled the industry to reach its maturity phase.

After studying the industrial districts of the United Kingdom at the end of the 1800s, Marshall offered a coherent interpretation on external economies arising from the geographic concentration of industry. He indicated the abundance of skilled workers, the presence of related industries and the relatively free circulation of knowledge within the district as key although not exclusive externalities.[7] Since the end of the 20th century and, above all, in Latin countries such as Italy and France, other authors again insisted on the

[7] Marshall, *Principles*, Bk. IV, Ch. X; Krugman, *Geography*; Scranton, *Endless*; Wilson and Popp, *Industrial*, and Popp and Wilson, "Life Cycles," 2975-2992.

benefits of geographically concentrated industry, pointing out as decisive sources of competitive advantage an industrial fabric dominated by the small and medium-sized firm and the existence of institutions which favour cooperation within the district.[8] However, these works tended to undervalue the role played by the big company as the backbone of the district.[9]

Perspectives focused more on the history of business, such as Landes, Chandler, Tolliday, Klepper and Lazonick, insisted on an increase in efficiency arising from the size. They underlined that big companies played a central role in industrialized economies from the triumph of the second industrial revolution, due to their accumulation of technological, organizational, and distribution and marketing capabilities, among others.[10] Evolutionary economics also emphasized the potential of the big company to lead industrial development in sectors with significant economies of scale and considerable R&D expenses.[11]

Although the productivity of the large mass production company was based, as indicated by Chandler, Lazonick, Tolliday and Amatori, on the mass use of semi-skilled production workers in factories with an abundance of machinery, it also required a greater

[8] Bagnasco, *Italie*; Becattini, *Mercato*; Brusco, "The Emilian model," 167-184; Lescure, *mobilisation*; Daumas, Lamard, and Tissot, *territoires*; Le Bot and Perrin, *chemins*; Daumas and Lescure, "Les territoires de l'entreprise?" 6-21.

[9] Harrison, *Lean*; Markusen, "Sticky Places in Slippery Space," 293-313; Klepper, "The Origins and Growth of Industry Clusters," 15-32; Catalan et al., *Distritos*.

[10] Chandler, *Visible*; Chandler, *Scale*; Landes, *Wealth*; and Lazonick, "Innovative Enterprise or sweatshop economics?" 65-114.

[11] Nelson and Winter, *Evolutionary*; Freeman, "The 'National System of Innovation'," 5-24; Klepper, "Entry, Exit, Growth," 562-583; and Freeman and Louçã, *Time*.

intensity both in the number and in the training of the managers.[12] Despite the fact that the big capitalist industrial companies based their competitive success on an efficient exploitation of economies of scale and scope internal to the company,[13] this did not prevent them, as also pointed out by Chandler, Amatori and Hikino, from organizing networks of clusters around them, formed by their auxiliary industry and their strategic suppliers.[14] This is consistent with the tendency of the automotive industry to be concentrated on a regional level.[15]

Markusen analyzed three types of industrial district (hub-and-spoke districts; satellite platforms; and state-anchored districts), which all revolved around big companies.[16] In the most common, the hub-and-spoke districts, a few big firms acted as coordinating centres or hubs of the regional economy. This focus fitted in well with Porter's theory on clusters as a key source of competitive advantage globally which, unlike the Italianate district, did not require a certain size of company to obtain the benefits of a geographically concentrated industry. [17]

The government can likewise influence the creation of competitive advantage on applying strategic industrial policies.[18] Gerschenkron, Chang and Shapiro, among others, noted the tendency toward growing government intervention in developing economies

[12] Chandler, *Visible*; Lazonick, *Competitive advantage*; Tolliday, *Rise and Fall*.

[13] Chandler, *Scale*; Lazonick, *Competitive advantage*.

[14] Chandler, Amatori and Hikino, "Contours of Big Business," 13.

[15] Klepper, "The Origins and Growth of Industry Clusters," 15-32.

[16] Markusen, "Sticky Places in Slippery Space," 293-313.

[17] Porter, *Competitive*; Porter, "Clusters," in *Competition* ed. Porter, chap.9; and Porter "Locations, Competition and Economic Development," 15-34.

[18] Mazzucato, *Entrepreneurial*.

with the aim of catching up with the first-comers. [19] Chang retrieved the argument in defence of the infant industry already present in Hamilton and List. [20] Chang recalled that the transition toward activities with greater added value did not always occur spontaneously. A substantial number of developing countries adopted a wide range of strategic-type industrial, commercial and technological policies. The need for the governments of developing countries to move away from pure *laissez faire* policies and contribute to industrial development with an efficient incentive system is shared by a significant number of authors. [21]

For many economic historians, the quality of the institutions has been the key to the success of modern economic growth.[22] North and Mokyr indicated the institutional structure of incentives as a decisive variable in the gestation and dissemination of the first industrial revolution. Acemoglou & Robinson underlined that the prevalence of non-

[19] Gerschenkron, *Economic*; Chang, *Kicking away the ladder*; Reinert, *Rich*; and Andreoni and Chang, "Bringing production," 173-187.

[20] Hamilton, *Report;* and List, *National*.

[21] Johnson, *MITI*; Evans, *Embedded*; Woo-Cumings, *Developmental State*; Amsden, *Rise*; and Stiglitz and Lin, *Industrial*.

[22] North, *Institutions*, defines the institutions as the elements which shape the rules of the game which structure political, social and economic interactions, distinguishing between institutions which are formal (laws) and informal (values, customs and traditions). Meanwhile, Mokyr, *Enlightened*, indicates that the economic analysis tended to overemphasize the role of the former, such as property rights, to the detriment of the latter, in his opinion underestimating the central role played by the cultural environment in the emergence of entrepreneurs and inventors, and Acemoglu, Johnson, and Robinson, "Institutions," 386-472, focus on the economic institutions of a formal nature. For their part, authors such as Marglin, *Golden Age*, and Eichengreen, *European*, have focused on the role of those institutions of a neo-corporate nature which regulate the relations between entrepreneurs, workers and governments, thus connecting with the analyses on industrial districts of a Marshallian type undertaken by authors such as Brusco, "The Emilian Model."

extractive institutions in the West was crucial for very long-term development[23]. Eichengreen pointed towards the institutions which favoured cooperation after the Second World War as a key to the golden age of growth[24]. The institutional environment was also indicated as a central element of competitive advantage from the Italian or neo-Marshallian perspective[25]. Similarly, Brusco praised the system of industrial relations of Emilia-Romagna, which ensured local salary rises hand-in-hand with productivity increases and considered this to be one of the district's main factors of competitive advantage[26]. According to this vision, which Zeitlin called neo-Marshallian, cooperative attitudes would dominate in the district of small and medium-sized companies[27]. The companies from this type of district would moreover obtain their competitiveness thanks to access to public or quasi-public goods, such as infrastructures, education and technology centres, and specialized financial institutions[28].

This article intends to assess the role played by external economies, leading companies, national government industrial policies and local institutions to explain the take-off of the automobile industry in Barcelona and São Paulo. The next section analyzes the origins of both clusters. The keys to their take-off, which took place between the beginning of the 1950s and the 1970s, are subsequently studied. Finally, the conclusions are presented.

[23] Acemoglu and Robinson, *Nations.*

[24] Eichengreen, *European*.

[25] Bagnasco, *Tre Italie*; Becattini, *Mercato*; Brusco, "The Emilian model," and Becattini et al., *Handbook.*

[26] Brusco, "The Emilian model," 167-184.

[27] Zeitlin, "Industrial Districts", in *Oxford,* eds. Jones and Zeitlin, 219-242.

[28] Porter, "Clusters and Competition." chap. 9.

The slow emergence of the cluster: external economies, leading companies and local institutions, 1900-1950

The number of inhabitants per automobile brand can be used as an initial indicator of the degree of development achieved by the automobile industry at the beginning of the 20th century. This ranking, shown in Table 1, was led by France and Belgium, with around 250,000 inhabitants per brand in 1901. A second group of countries, with in the region of 370,000 inhabitants, was formed by the USA, the United Kingdom and Switzerland. Three countries with a small population, Australia, Denmark and the Netherlands, were positioned with between half a million and a million inhabitants. Sweden, Canada and Germany had brands for between 1.2 and 1.5 million inhabitants, while Italy had generated one automobile firm for every 3 million inhabitants. Note that Spain was fairly low, with only one brand for each 5 million inhabitants. Brazil does not even appear on the list.

Table 1 suggests that the automobile industry in Spain, with only 4 indigenous brands in 1901, was far from the level of the industrialized countries group. However, three of these four manufacturers set up their businesses in Barcelona, the capital of Catalonia and a region which at the time had around 2 million inhabitants. The almost 700,000 inhabitants per manufacturer can indicate that there was already a certain interest in Barcelona for a relatively new industry. This was not yet the case of São Paulo, which only had five automobiles registered in 1901.[29]

Table 1

The automobile industry in 1901. Number of local brands and inhabitants per brand.

[29] Forest, *Automóvei*.

		Brands	Thousands of inhabitants per brand
1.	France	167	243
2.	Belgium	27	252
3.	United States	215	362
4.	United Kingdom	112	371
5.	Switzerland	9	371
6.	Australia	7	542
7.	Denmark	3	865
8.	Netherlands	6	870
9.	Sweden	4	1289
10.	Canada	4	1384
11.	Germany	35	1578
12.	Italy	11	3080
13.	**Spain**	**4**	4665

Sources: Brands from Catalan, "The life-cycle," 77-124. Population from Maddison, *Monitoring*.

Although the industrial engineer and textile entrepreneur Francesc Bonet built an initial internal combustion automobile in Barcelona in 1889, the cluster did not begin to germinate until the end of the century. In 1898, the lieutenant colonel and electrical entrepreneur Emili La Cuadra set up a new firm with the aim of manufacturing automobiles. After hiring the young Swiss engineer Markus Birkigt, La Cuadra was capable of manufacturing around five vehicles, but it went bankrupt one year later.

However, both its facilities and its designs were used by its successor, the company of J. Castro, in which Birkigt remained as the main engineer[30].

In 1904, a group of Catalan industrialists, led by Damià Mateu and Markus Birkigt, established Hispano Suiza. The lightness and durability of the engines designed by the Swiss engineer allowed the company to export its first production licences in 1907. Seeking to expand its activity, Hispano opened an initial agency in Paris in 1911 and built its own factory two years later. In 1915 Hispano Suiza was capable of winning, with a light engine designed in Barcelona, the French government tender to equip its warplanes. The aircraft engines produced during the First World War with its technology made profits surge in the Barcelona company.[31]

Together with Hispano Suiza, other manufacturers appeared in Barcelona before the Great War. The interruption of imports during the conflict motivated modest local entrepreneurs to embark on the handcrafted production of automobiles, although the majority had an ephemeral lifespan.[32] The most prosperous initiative was that of Arturo Elizalde, originating in 1909, when this industrialist, of Cuban-Catalan descent, opened a workshop to supply and manufacture components such as crankshafts, valves, differentials and bumpers. He launched his first car in 1913 and tried to follow the path traced by Hispano Suiza, producing luxury cars and their engines until 1927.

After ruling out Barcelona because of its high rate of labour disputes, in 1920 Ford established a plant in the free port of Cadiz, on the Spanish southern Atlantic coast.[33]

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[30] De Castro, *Historia*; Gimeno, *automóvil*; Polo, *Hispano-Suiza*; Catalan, "La creación de la ventaja comparativa," 113-154; and Nadal, "contencioso," in *économies*, ed. Bourillon et al., 332-342.

[31] Polo, *Hispano*; and Nadal, "contencioso," in *économies*, ed. Bourillon et al., 332-342.

[32] Catalan, "The life-cycle," 77-124.

[33] Wilkins and Hill, *American*.

However, in the middle of 1923 Ford decided to move to Barcelona, after noting the difficulties of operating in the Andalusian port, where the production rate, set at 5,000 vehicles a year, hardly succeeded in reaching one thousand units.[34] The weight of the CKD kits assembled in Barcelona increased sevenfold between 1927 and 1929, being exported in part to Italy, North Africa and Portugal. [35] In turn, Ford's employees amounted to 494 in 1929. Ford's competitive prices seriously affected the local manufacturers, intensifying the drastic reduction in profits suffered by Hispano Suiza, and forcing Elizalde to abandon the production of automobiles in order to concentrate on aircraft engines.[36]

Ford's decision to move to Barcelona is proof of the possible existence of a district. Barcelona, like Cadiz, had similar advantages in its free port area, but could also provide the classical Marshallian externalities, which the Andalusian port lacked: trained workers, specialized suppliers, and a climate of diffuse knowledge of the world of automobiles.[37] Another proof would be the emerging institutional fabric, which disseminated knowledge and, thereby, accompanied the development of the district. Important institutions included the Chamber of Commerce, whose main mission was to defend protection as a tool of industrialization; the Escuela Industrial, which trained entrepreneurs and skilled technicians; and the Escuela del Trabajo, which since 1907 had a specific department to train machine operators. The sector's first specific institution was the Real Automóvil Club de Cataluña, created in 1906, which organized the first

[34] Wilkins and Hill, *American*; Estapé, "Ford," in *Ford*, ed. Bonin et al., 439-450; and Catalan, "La creación de la ventaja comparative," 113-154.

[35] Lebrancón, "El recinto aislado."

[36] San Román, *Ejército*, and "Política económica y atraso automovilístico," 65-93.

[37] Catalan, "La creación de la ventaja comparativa."

automobile exhibition in 1913. In 1919, the First Automobile Fair of Barcelona was organized, exhibiting automobile products from 58 both Spanish and foreign companies. The Fourth Fair, held in 1925, included the presence of 408 companies from the sector.[38]

The outbreak of the Great Depression significantly affected the trade balance of Spain. To curb the imbalance, the provisional government of the Republic, proclaimed in April 1931, was forced to increase tariffs and introduce quotas on the importing of numerous products, including automobiles. However, before the end of the year, it established tariff reductions on the importing of components and parts, provided that the percentages of domestic content in the cars assembled increased. Although the local manufacturers were languishing compared with foreign subsidiaries, the auto components industry was able to progress and employed 4,000 people by 1935. When the Civil War broke out in 1936, approximately half of the components used by Ford were manufactured in Barcelona. [39]

Following the pattern of the rest of the European subsidiaries, during the Great Depression 40% of the capital of Ford's Spanish subsidiary became locally owned, being transformed into Ford Motor Ibérica (FMI). After Dagenham, FMI was Ford's European subsidiary with the highest profit in 1935.[40] At the time, Ford employed 750 people in Barcelona, while its suppliers already employed a further 2,500 people. The good progress of the Catalan subsidiary encouraged Ford to plan the construction of a bigger factory. The project, ratified on 5 May 1935, was frustrated by the military uprising in July 1936.[41]

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[38] Catalan, "The life-cycle of the Barcelona automobile-industry cluster."

[39] Estapé, "Ford," in *Ford*, ed. Bonin et al., 439-450.

[40] Wilkins and Hill, *American*.

[41] Ibid.

The military uprising also prevented GM from building a big factory in Barcelona. Like its neighbours from Dearborn, the company from Flint had likewise initially chosen Andalusia (Málaga) to establish its subsidiary in Spain, although in 1927 they transferred it to Madrid. Five years later, General Motors Peninsular (GMP) relocated again, this time to Barcelona, where it assembled Chevrolets and other models until 1936. When the Civil War broke out, GMP was also planning the construction of a new factory in Barcelona, where it intended to assemble 20,000 cars per year, of which 70% would be for export. [42]

The war ended on 1 April 1939 with the victory of General Francisco Franco, who remained as head of the Spanish state until his death on 20 November 1975. Both GM and SIAT – a company participated by Fiat – sent proposals to the new government to build assembly plants in the industrialized territories of Spain, Catalonia and the Basque Country. None was accepted by the new regime.[43] At the end of 1939, the Ministry of Industry limited the foreign ownership of Spanish companies to a maximum of 25%. In September 1941, the Spanish government created a public holding company, the Instituto Nacional de Industria (INI), the mission of which was to encourage industrial autarky. In 1946, the Catalan factory of Hispano-Suiza was sold by the then owner and former Francoist Mayor of Barcelona, Miguel Mateu, to the INI. The Hispano Suiza factory became part of the INI subsidiary, Empresa Nacional de Autocamiones S.A. (ENASA). The main objective of this publicly owned company was the construction of a modern truck factory in Madrid, transferring the technical knowledge accumulated in the Barcelona plant, which would then be managed from the capital of Spain.

Unlike GM, Ford did not abandon Barcelona at the end of the Civil War. However, the profit of its subsidiary never recovered its pre-war levels. The marked underutilization

[42] Jordi Catalan, "Fabrica y franquismo," and San Román, *Ejército*.

[43] *Ibid*.

of the Barcelona factory explains why the number of employees went down drastically, having descended to just 293 workers in 1942.[44] FMI barely manufactured 1,000 trucks between 1945 and 1949, a volume which could not offer profitability. Finally, in 1954 Ford ended up doing away with its Spanish subsidiary, which became Motor Ibérica (MI), with local capital. Dearborn also disposed of its facilities in other countries whose industrial policy tended to be considered as excessively nationalist, such as France and India. [45]

The ravages of the Franco regime radically transformed the Catalan cluster. The Automobile Fair of Barcelona did not open again until the 60s. The renowned luxury automobile brand, Hispano Suiza, became a second-rate plant depending on a public company run from outside the district. The Ford subsidiary had become a Spanish private company without its own technology, which struggled to produce light commercial vehicles and agricultural tractors. Mass production had not yet reached Barcelona. However, despite the difficulties, in 1950 the Barcelona district was home to 131 factories and workshops producing components such as engines, pumps, distributors, headlights, cylinders, carburettors and ball bearings.[46]

The origins of the São Paulo cluster are fairly different to those of Barcelona, due to the much greater initial delay. Brazil was the last American country to end slavery, the process being delayed until 1888. The capital accumulated by the wealthy coffee estate owners from the interior of São Paulo state sustained the commercial and industrial growth of their capital, together with some importers from the end of the 1800s. In the

[44] Carreras and Estapé, "Spanish," in *Entrepreneurship*, eds. Linskey and Yonekura, 123-151.Estapé, "Ford," in *Ford*, ed. Bonin et al., 439-450.

[45] Wilkins and Hill, *American*; and Tolliday, "Origins," in *Ford*, eds., Bonin et al., 153-242.

[46] Catalan and Monteagudo, "ruptura," in *Atlas*, ed., Nadal, 233-384.

first decade of the 20th century, we already have records of the existence in the capital of São Paulo of some 326 industrial companies, employing some 24,000 manufacturing workers[47]. These included shipyards, several steam machine manufacturers and agricultural equipment and transport material manufacturers.

In 1901, there were only five automobiles registered in São Paulo, but five years later the figure had risen to 84.[48] It was the drivers, who tended to accompany the cars imported, who favoured the dissemination of the first automobile knowledge in the region.[49] In 1904, the company 'Luiz Grassi & Irmao Indústria de Carros e Automóveis' was founded to build and repair horse-drawn carriages, and in 1907 it assembled its first Fiat car.[50] However, above all the small repair and part manufacturing workshops were at the origin of the São Paulo cluster. They arose to serve the spare parts market of a vehicle pool which, in the state overall, increased from 6,000 to 70,000 vehicles during the 1920s.[51] In 1927, the São Paulo firm Souza Noschese managed to build the first internal combustion engine which used all materials of Brazilian origin.[52]

Following the expansion of the market and the availability of specialized suppliers and labour, Ford, GM and International Harvester installed their first factories in São Paulo. Like in Barcelona, it was less costly for them to import dismantled cars. Ford inaugurated its assembly line in January 1920, taking advantage of facilities leased in Praça da República, in the heart of the city. A few months later, it built a new factory in

[47] Dean, "Industriales," in *Burguesías*, eds. Cerutti and Vellinga, 23-54.

[48] Forest, *Automóveis*.

[49] Gonçalves, *Século*; and Wolfe, *Autos*.

[50] Latini, *implantaçao*.

[51] Forest, *Automóveis*.

[52] Wolfe, *Autos*.

the Bom Retiro neighbourhood.[53] In 1925, its output reached 14,861 vehicles, while sales rose to 24,500 units.[54] In January 1925, the other Michigan giant, GM, inaugurated its factory in the Ipiranga neighbourhood, the industrial heart of the city. According to the company itself, its decision to set up in São Paulo arose from a study performed by the management on the viability of the location.[55] The GM executives indicated especially the availability of electric energy, oil, raw materials, and parts and components for the repair market. In 1927, after having assembled 25,000 Chevrolets, General Motors do Brasil began to build a new factory in São Caetano do Sul, a municipality crossed by the main road and the railway which link the Port of Santos with the capital of the state. Inaugurated in 1929, its 600 workers tripled those of Ford.

The big tyre companies had also set up in Brazil, attracted by its abundant reserves of raw material. During the second decade of the 20th century, they began to establish themselves in Rio de Janeiro. However, they soon understood that São Paulo was a better option, because it enjoyed the advantages associated with a geographically concentrated industry. Between 1923 and 1929, Pirelli, Firestone, Goodrich and General Tire opened plants in the industrial capital of a country whose rainforest contained a generous supply of the key raw material for their activity.[56] Henry Ford's dream of colonizing the Amazon, promoting plantations of hevea brasiliensis from Fordlândia and Bellterra, was less successful. These experiments ended up failing, not having paid sufficient attention to the environmental conditions of tropical ecosystems.

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[53] Wilkins and Hill, *American*.

[54] Gonçalves, *Século*; and Wilkins and Hill, *American*.

[55] General Motors, *General*.

[56] Nascimento, *Formaçao*.

In 1928, the number of industrial establishments in São Paulo had risen to 9,603, overall employing some 150,000 people, who contributed 37% of Brazilian industrial production. Among them, 317 establishments were already devoted to the construction of transport material and employed some 5,000 workers[57]. The car body manufacturer Grassi, established in 1920, was especially important. At the end of the decade, it was building its own buses and moreover supplied around 60 bodies a day for the trucks and buses of Ford and GM.

There, south of the equator, like on the banks of the Mediterranean, various institutions endeavoured to support the motorization of São Paulo. The first car race of Latin America was held in the city on 26 July 1908. It was organized by the 'Automobile Club of São Paulo', founded 15 days earlier.[58] Ten years later, under the patronage of the state government, the 'I Congresso Paulista da Estradas de Rodagem' took place, when the work building the main Santos-São Paulo main road, which began in 1913, was about to end.[59] Furthermore, the First Automobile Fair of São Paulo was held on 13 October 1923, five editions being held over the decade.[60] As for educational institutions, the opening of the mechanics schools of Ford and GM stands out, since they trained workers both for the assembly line and for after-sales services.[61] Finally, apart from the automobile industry, the establishment of the Centro das Indústrias do Estado de São Paulo in March 1928 was especially important. For the first time, this was an organization which had a clearly protectionist discourse.

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[57] Negri, *Concentraçao*.

[58] Gonçalves, *Século*.

[59] Forest, *Automóveis*.

[60] Gonçalves, *Século*.

[61] Nascimento, *Formaçao*.

Similarly to the Iberian case, the assembly establishments that Ford also inaugurated in Recife (1925), Porto Alegre (1926) and Rio de Janeiro (1927) were unsuccessful. [62] This would indicate the lack of Marshallian external economies which were, on the contrary, already present in the capital of São Paulo. The case of General Motors do Brasil ratifies this hypothesis, given that the company's own management maintains that the choice of São Paulo for its Brazilian establishment was linked to its character as the main industrial hub of Latin America. [63]

The big US manufacturers did not only provide the emerging district with production capabilities, promoting the assembly of their vehicles. They also transferred distribution and marketing capacities, since Ford, GM and even Studebaker created dense networks of agents which converted them into the first companies with commercial delegations throughout the country. São Paulo again won the game in this field. Studebaker had begun to operate from Rio and, in 1926, ended up implicitly recognizing the externalities of the São Paulo capital, transferring its registered offices there. [64]

The outbreak of the Great Depression also considerably affected the Brazilian economy. GM, which had just opened a modern factory in São Caetano, within the ABC Region,[65] experienced a considerable contraction of demand during the Great Depression. The already low number of 4,051 vehicles assembled in 1931 dropped to just 1,566 in the following year. To ensure its survival in Brazil, GM tried to find a niche as a bus

[62] Wilkins, *Maturing*.

[63] General Motors, *General*.

[64] Wolfe, *Autos*.

[65] ABC is the name given to the area between the city of São Paulo and the Port of Santos, on consisting of the municipalities of Santo André, São Bernardo and São Caetano.

manufacturer, although its main activity until the mid-1950s ended up being the production of refrigerators. [66]

The recovery of the São Paulo economy was driven above all by national capital, which built new although not very big factories. During this process, the capital from coffee tended to become less important. By 1949, São Paulo state generated around 49% of Brazil's industrial added value. The share of consumer durables was even higher, reaching 72% of the federation's total.[67] Brazil was mostly governed by Getúlio Vargas, whether as interim president (1930-34), constitutional president (1934-37) or as an open dictator at the head of the *Estado Novo* (1937-45).[68]

This was not a good period for US transnational corporations. In 1940, GMB assembled its vehicle number 150,000, indicating an average production of just over 10,000 units per year. The situation was no better for Ford, whose production was very far from its installed capacity which, in theory, allowed it to build around 18,000 vehicles a year.

The production of parts and components experienced a notable boom during the Second World War, as a result of the lack of imports. When the war ended, around a hundred workshops were spread around São Paulo and its ABC Region, employing some 3,500 people and with a capacity to manufacture around 2,000 different parts, especially components such as electric accumulators, radiators, brake discs, tyres, wheel rims, axles and crowns and pinions for gears[69].

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[66] General Motors, *General*.

[67] Negri, *Concentraçao*.

[68] Fausto, *Getúlio*.

[69] Dean, *Industrialization*.

Despite the scarce development experienced, dozens of companies produced parts and components from the end of the 30s. New tyre manufacturers, such as Goodyear (1938) and Dunlop (1939), set up in São Paulo and the 'Cia. Americana Industrial de Omnibus' (CAIO) tried to promote the construction of buses.[70] The Ipiranga neighbourhood attracted the company 'Veículos e Máquinas Agrícolas' (Vemag), an initiative which included the collaboration of the hoteliers Domingos Fernandes from Rio de Janeiro, the Swedish investor Swend H. Nielsen, and the representative of Studebaker in Brazil, Melvin Brooks.[71] Vemag, which had one of the most important stocks of heavy tools in South America, assembled its first trucks – Studebaker and Massey Harris – in 1948. Shortly afterwards, it embarked upon negotiations with Scania to assemble its commercial vehicles starting from imported CKD kits.[72]

As occurred in Barcelona, the São Paulo district had been capable of generating Marshallian type externalities, but had not achieved the take-off of mass production. The end of commercial restrictions, once the conflict ended, again placed the majority of parts manufacturers in a difficult situation. [73] However, the capacities accumulated in both regions after decades of activity placed them in a position to take advantage of any favourable change of situation in order to commence this take-off. This occurred in the 1950s, when both Spain and Brazil adopted strategic-type industrial policies, which aimed for the comprehensive development of the sector. [74]

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[70] Nascimento, *Formaçao*.

[71] Sandler, *DKW*.

[72] Scania, *Scania*.

[73] Nascimento, *Formaçao*.

[74] Shapiro, *Engines*; Wolfe, *Autos*; Catalan, "Strategic policy revisited," 207-230; Catalan and Fernández-de-Sevilla, "Staatliche," in *Automobilindustrie*, eds. Tilly and Triebel, 254-284; Fernández-de-Sevilla, "Inside the dynamics," 287-315.

The take-off, 1950-73: Strategic policies, leading companies and local suppliers

In 1950, the production of automobiles both in Spain and in Brazil hardly exceeded a thousand vehicles a year and assembly prevailed over production in the industry. Neither of the two economies appeared on the list of the world's first 15 producers (Table 2). However, during the 50s, Barcelona and São Paulo were major players in the take-off of the automobile industry in their respective countries. By 1973, Spain and Brazil were already in 10th and 11th position in world automobile production. The Catalan capital was responsible for 50% of Spanish production,[75] while São Paulo enjoyed an overwhelming dominance, above 90%, in Brazilian production.

Table 2

Main automobile producers (thousands of units)

	1950			**1973**	
1.	USA	8,003	1.	USA	12,638
2.	UK	784	2.	Japan	7,088
3.	Canada	390	3.	FRG	3,949
4.	USSR	359	4.	France	3,242
5.	France	358	5.	UK	2,164
6.	FRG	305	6.	Italy	1,960
7.	Italy	129	7.	USSR	1,604

[75] Catalan and Monteagudo, "ruptura," in *Atlas*, ed., Nadal et al., 233-384.

8.	Belgium	49	8.	Canada	1,575
9.	Australia	38	9.	Belgium	1,016
10.	Japan	32	10.	**Spain**	**823**
11.	Czechoslov.	31	11.	**Brazil**	**733**
12.	Sweden	17	12.	Australia	410
13.	GDR	9	13.	Sweden	383
14.	Hungary	3	14.	Mexico	283
15.	Netherlands	1	15.	Argentina	282

Sources: Own elaboration from United Nations, *Statistical Yearbook*; and OICA, *Production Statistics*.

The failure of the autarchic project obliged the Franco regime to modify its economic orientation in 1948. The INI ended up approving the project led by Banco Urquijo to produce passenger cars, under licence from Fiat, in the Zona Franca of Barcelona. However, it insisted on being the principal shareholder. The Sociedad Española de Automóviles de Turismo (SEAT) was established in 1950, its strategic shareholders being the public holding company INI (51%), Banco Urquijo (7%) and Fiat (7%)[76]. In return for operating in a closed market with hardly any competition, SEAT was required to use high percentages of domestic content. Its first model, the SEAT 1400, was launched onto the market in 1953 and one year later already contained 60% of locally produced components[77].

[76] Ciuró, *Historia*; Solé, *SEAT*; San Román, *Ejército*; Catalan, "La SEAT del desarrollo," 143-192; Tappi, *impresa*.

[77] Catalan, "La SEAT del desarrollo," 143-192.

Fiat had, indeed, unsuccessfully attempted to set up in Spain since 1931 and its experience, like that of Ford in 1923, demonstrates the difficulties of operating in settings without a sufficient industrial base. A few months before the proclamation of the Republic, Fiat took control of the Hispano Fábrica de Automóviles y Material de Guerra, a subsidiary of Hispano Suiza established to please King Alfonso XIII, in Guadalajara, a province adjacent to Madrid.[78] The subsidiary never obtained good results, hindered by the lack of knowledge, labour and local suppliers of inland Spain. Finally, it ended up transferring the assets of the land vehicle section to the Italians, who began to prepare the assembly of the Fiat 514. Evidence shows that, in Guadalajara, they only manufactured the bodywork structure, made from beech wood which was then lined with sheets imported from Italy, from where the engines, axles and gearboxes also arrived.[79] Finally, in December 1935, after having assembled less than 300 cars in four years, Fiat decided to liquidate and wind up its Castilian subsidiary.

In 1943, Fiat sent its engineer Giuseppe Corziatto to Spain in order to assess a possible return. Accompanied by the INI engineer, Sánchez Bautista, Corziatto visited 41 establishments located in the so-called Northern region – mainly the Basque Country –, 15 in Barcelona, and 10 in inland Spain – all in Madrid except for one in Valladolid. About Barcelona, the Fiat engineer stressed especially the parts cast by the company Dalia, the fuel pumps and distributors for the engine ignition of Auto-Electricidad, the headlights of Artés de Arcos and of Biosca, and the parts for brakes and clutches of Industrias Cabré. He also indicated that Ford commissioned the production of all the parts of its three-ton truck from companies in the district, with the exception of the powertrain

[78] It is no accident that the subsidiary was characterized as "*la hijuela no deseada de la barcelonesa Hispano Suiza*" [the unwanted stepdaughter] in Nadal, "La Hispano," 273-290.

[79] Lage, *Hispano-Suiza*.

and the drive axle. In his conclusions, Corziatto maintained that, if they produced in Spain, the greatest difficulties would be in Madrid and that these would be reduced considerably in Catalonia and, even more, in the Basque Country. However, the negotiations with the INI broke off in that same year, and were not taken up again until January 1947.[80]

At the end of 1948 Suanzes, President of the INI, announced the choice of Barcelona as the location for the future joint venture, justifying it on the basis of the abundance of both suppliers and workers. In 1950, there were 433 automobile part workshops and factories registered, of which 30% were in the province of Barcelona, 21% in Biscay, 13% in Guipúzcoa and 11% in Madrid. Although there are no reliable data on the number of employees, the evolution of metallurgical workers can serve as an indicator. In the city of Barcelona, these increased from 10,588 in 1905 to 56,890 in 1950, in addition to those in the surrounding towns which were already important metal processing centres, such as L'Hospitalet, Cornellà and Sabadell.[81]

In 1957, SEAT launched the 600 model. This was not only the first mass-produced car manufactured in Barcelona, but also 97% of its components were locally produced.[82] The launch of the 600 allowed SEAT to increase its production volume tenfold between 1961 and 1974. The output of the 600 model increased from 12,000 units in 1958 to 80,000 units in 1970. The overall production by SEAT exceeded 100,000 cars per year in 1965 and reached 360,000 cars in 1974. Although the 600 was the model most produced during this period, having a 29% share of the 2.5 million cars manufactured, other models

[80] Catalan, "SEAT represa," p. 27-72.

[81] *Ibid*.

[82] Catalan, "La SEAT del desarrollo," 143-192.

also obtained good figures, such as the 850 (27%), the 124-1430 (24%), and, the future blockbuster, the 127 (12%), the latter launched in 1972.

ENASA, Motor Ibérica and the former Elizalde also prospered starting from the end of the 50s. The first of these companies produced Pegaso heavy trucks, although its most modern plant was built in Madrid. The second one built Ebro brand light trucks first, under licence from Ford and, from 1965, under patent from Massey Ferguson, which acquired 32% of the company's capital.[83] For its part, Elizalde, reconverted into Empresa Nacional de Motores de Aviación SA (ENMASA), reached an agreement with Daimler Benz AG to produce diesel engines and Mercedes vans, even developing an engine for SEAT. In 1969, it became CISPALSA, Mercedes being its main shareholder and the INI remaining in a minority position. In the mid-1970s, reconverted into Compañía Hispano Alemana de Productos Mercedes-Benz (CHAM Benz), it produced around 10,000 vehicles a year, a similar volume to ENASA and Motor Ibérica. [84]

Until the mid-1970s, Spanish industrial policy maintained strict quotas on automobile imports, strong domestic production requirements for the manufacturers installed and a restrictive policy of authorizations[85]. When it relaxed the presence of foreign capital (increasing it to a maximum of 49% of the share capital), the general trend was toward the creation of companies in which European component manufacturers had a stake as minority shareholders.[86] The market was the main form of coordination between the auxiliary industry and the end manufacturers, among which SEAT stood out.

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[83] Estapé, "Ford," in *Ford*, eds. Bonin et al., 439-450.

[84] García, "La evolución de la industria," 133-163.

[85] Catalan, "La formación de la ventaja comparativa," 113-154; and García Ruiz, "La evolución de la industria," 133-163.

[86] Ortiz-Villajos, "Aproximación a la historia," 135-172.

The policy of the public constructor was to have two suppliers per product and it rarely tended to have a stake in the capital of its suppliers. Indeed, the internal control of the suppliers by holding a stake in the capital was more frequent for the suppliers located far from the district, such as Purolator Ibérica (Madrid) and Victorio Luzuriaga (Basque Country). Likewise, when the production of certain components was shown to be problematic, an attempt was made to introduce suppliers of Fiat. This was the case of ball bearings, produced from 1951 by the Empresa Nacional de Rodamientos, a subsidiary of the INI established in Madrid in 1947, which operated with licences from the Swedish firm SKF. The continuous production deficiencies in Madrid meant that, in 1956, SEAT fostered the establishment in Barcelona of a subsidiary of the Italian firm RIV, a supplier of Fiat in Turin.[87]

The 1958 industrial census showed that, in the Barcelona district, 15,823 people were employed in the production of road vehicles, of whom 5,559, one third, were employed by SEAT. The consolidation of domestic production enabled the district to attract foreign technology and capital, which came from companies such as Pianelli, Traversa and Bendix. In the mid-60s, some of the companies which stood out were Harry Walker (carburettors), Deslite (bearings), Auto Electricidad (fuel pumps), Fundiciones Industriales (liner and piston rings), Faros Españoles (headlights), Artés de Arcos (dashboards), Gallital Ibérica (water pumps), Skreibson (radios), Eaton Livia (valves for engines), Pirelli (tyres) and the various subsidiaries of Pujol y Tarragó, which would become FICOSA, one of the district's most dynamic companies.

The origins of FICOSA go back to 1947 when Josep M. Pujol, still an adolescent, left school to become an apprentice in Talleres Motor, an establishment devoted to repairing carburettors and manufacturing control cables. There he became close friends

[87] Catalan, "SEAT," in *Barcelona*, ed., Balfour, 27-72.

with a mechanic, Josep M. Tarragó, who would become his future partner and brother-in-law. In 1949, after Pujol had spent some months in the workshops of the Barcelona section of Mercedes-Benz, they jointly established the company Pujol y Tarragó S.L., a small workshop devoted to manufacturing cables for brakes, accelerators and clutches, located in the Barcelona neighbourhood El Clot. The company supplied cables to Biscuter, Eucort, Pegaso and IMOSA, before becoming a supplier of SEAT, first indirectly, providing cables for the control panels manufactured by Bresel and later as a direct supplier. At the end of the 50s, Pujol y Tarragó began a strategy of diversification which involved creating small independent companies highly specialized in very specific products. Industrias Technomatic (windows and sun visors) and Transpar Ibérica (windscreen wipers and rear-view mirrors) both opened before the 60s. In the second half of the 60s they founded Cables Gandía SA (steel transmitters), Techno Chemie (rigid pipes) and Lames Ibérica (plastic materials). They were all small units controlled by a supervisor and which, when they gained a certain size, were managed by an executive. In 1974, Pujol y Tarragó created the Compañía Holding Serco, which became FICOSA in 1976, conceived to coordinate the network of industrial companies which operated as a division and whose managers enjoyed a wide margin of autonomy. The first of the subsidiaries which were established abroad, a workshop devoted to producing control cables located on the outskirts of Porto, in Portugal, opened in 1971.[88]

Between 1936 and 1960, the number of people employed by the automobile industry of Barcelona increased more than threefold, being around 20,000 people in 1962. Madrid and the Basque country, the next Iberian regions in number of employees, had

[88] Catalan, "Josep Maria Pujol," in *Cien Empresarios*, ed., Cabana, 702-711.

less than 10,000 each.[89] In the mid-70s, the automotive district of Barcelona employed some 55,000 workers (Table 3).

Table 3

Employment generated by the leading companies and total employment of the automobile cluster of Barcelona

	1962		**1976**
SEAT	5,507	SEAT	27,053
ENASA	3,696	Motor Ibérica	4,722
Motor Ibérica	1,178	ENASA	3,616
Three biggest companies	10,318	Three biggest companies	35,391
Employment of the district	20,053	Employment of the district	55,131
Weight of the three biggest (%)	51.4	Weight of the three biggest (%)	64.1

Source: Catalan, "The life-cycle," 77-124.

Barcelona confirmed its leading role of main automobile industry cluster in Spain, despite the fact that its institutions were weakened as a result of the establishment of the Franco regime. The INI's centralizing policy forced SEAT, ENASA and ENMASA to have their head offices in Madrid. Motor Ibérica, under private control, was the only company with more than 1,000 workers which maintained its headquarters in Barcelona. Furthermore, the Automobile Fair of Barcelona could not reopen until 1966, more than

[89] Catalan and Monteagudo, "ruptura," in *Atlas*, ed., Nadal et al., 233-384.

three decades after the previous edition, that of 1935. Right from the beginning, the big companies from the sector internalized material training, creating technical schools, developing engineering departments and promoting training courses. ENASA inherited the Apprenticeship School of Hispano-Suiza and developed its facilities in Barcelona as an engineering centre.[90] Elizalde (then CIPALSA/Mercedes-Benz) had an Apprenticeship School from 1927.[91] SEAT inaugurated its school in Zona Franca in 1957 and, at the beginning of the 70s, built its Martorell Technical Centre, which became one of the main R&D centres of the Iberian Peninsula.[92] For its part, Motor Ibérica decided to locate its engineering department in its new Zona Franca facilities, which opened in 1968.[93] This set of internalized activities tended to replace the task formerly undertaken by local institutions, such as the Escuela Industrial and the Escuela del Trabajo. It is true that these organizations, like the rest of the educational institutions and those promoting industrial activity which were created or revitalized both by the Mancomunitat of Catalonia – established in 1914 and disbanded with the dictatorship of General Primo de Rivera in 1923 –, and by the Generalitat of Catalonia – restored in 1931 and abolished in 1939 with General Franco's dictatorship –, experienced a clear weakening during the Franco regime. However, although the institutional development of the cluster was less satisfactory than before the Civil War, the Marshallian externalities that hundreds of companies and thousands of workers could provide were reinforced.

In the mid-1970s, Barcelona province had around 300 plants which made automobile parts or assembled them. The cluster was highly hierarchized around its main

[90] Palomero, *Trabajadores*.

[91] Garriga, *Elizalde*.

[92] Catalan, "La SEAT del Desarrollo," 172-173.

[93] Echevarría & Voltes, *Nissan*.

companies, the biggest generating somewhat more than 60% of the total employment (Table 3). However, the rapid expansion recorded by the cluster is mainly explained by the emergence of SEAT, created with a weak link to the institutions of the district. SEAT, which in 1976 directly generated almost half of the district's employment (Table 3) and whose large demand for consumables sustained the majority of the cluster's companies, took off thanks to the protectionist policies applied. Therefore, the results obtained tend to confirm the hypothesis of Chang and of the rest of authors who insist on the need for industrial policies in developing countries. As observed below, the São Paulo cluster experienced similar evolution, although with some nuances.

In Brazil, Getúlio Vargas tried to promote truck construction in the 'Fábrica Nacional de Motores' (FNM). This publicly owned company was originally created with the financial support of the United States to build aviation engines under licence from Wright, during the Second World War in Rio de Janeiro. When the factory was in a situation to be able to produce, the conflict was already over and it ended up being reconverted to build trucks, under licence from Isotta-Fraschini.[94] The planned programme was to build around 200 trucks a year, using a minimum 30% of components of domestic origin. However, shortly after launching the first vehicles, it had to change its technological partner, given that the Milan firm was forced to abandon automobile construction. During the 50s, it continued to build trucks with another partner from Lombardy, Alfa Romeo. However, like ENASA in Madrid, the FNM in Rio never succeeded in becoming a very competitive company. Nevertheless, Vargas opposed its privatization during his last government as democratic president (1951-54).

Meanwhile, in the capital of São Paulo, 122 component manufacturers joined forces at the end of the decade to support market protection. They created he 'Associação

[94] Ramalho, "Estado," in *JK*, eds. Arbix and Zilbovicius, 159-179.

Profissional das Industrias de Peças para Automoveis e Similares de São Paulo' (latter Sindieças).[95] Its demands were well received by the government of Vargas, which came to power following the presidential election by direct vote in January 1951. In 1952, the Associação presented a report which highlighted the existence of 250 companies capable of manufacturing 162 groups of automotive parts and components. Six months later, Vargas issued Notice No. 288, which introduced a veto on importing 104 groups of parts and components. With Notice 311, of April 1953, Vargas also banned the importing of complete vehicles, only authorizing the entry of CKD kits, if they arrived without the parts specified in Notice 288.[96] Before the end of the year, Willys-Overland and Volkswagen had established assembly lines in São Paulo, while Mercedes-Benz installed its line in Rio de Janeiro.[97] However, as occurred with Ford and GM, their facilities were far from being true automobile factories.

Following the suicide of Vargas in August 1954, João Café Filho's new government reversed some of the measures taken, but maintained very low levels of vehicle imports.[98] When Juscelino Kubitschek (JK) won the October 1955 presidential election, Ford was producing 10 trucks a day despite having the capacity for 125. General Motors do Brasil, which could assemble some 200 vehicles a day, was hardly building five.[99]

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[95] Gattas, *indústria*. In September 1953, the Associação became the Sindicato da Indústria de Peças para Automóveis e Similares no Estado de São Paulo or Sindipeças.

[96] *Ibid*.

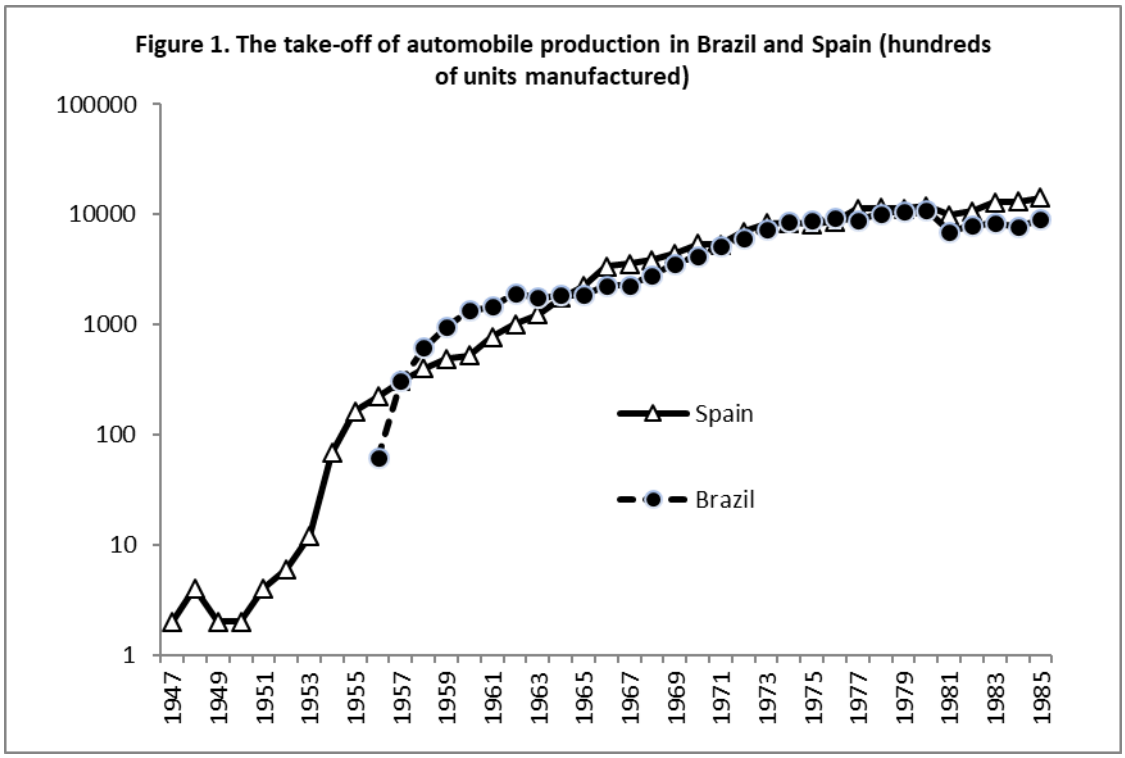
[97] Latini, *Implantação*.

[98] Nascimento, *Formaçao*; and Shapiro, *Engines*.

[99] Nascimento, *Formaçao*.

Figure 1

The take-off of automobile production in Brazil and Spain (hundreds of units manufactured



Sources: Own elaboration from Mitchell, *International*; Anfavea, *Anuário*; and García-Ruiz, "industria," in *Sobre ruedas*, ed. García-Ruiz, 13-93.

On 1 February 1956, shortly after taking office, JK promoted a National Development Plan (known as 'Plano de Metas'), which established 31 goals distributed in five major groups (energy, transport, food, capital goods and education), in addition to the construction of a new capital in Brasilia.[100] Automobiles were the only consumer goods indicated as a strategic objective. In order to ensure their production, the Executive Group of the Automobile Industry (GEIA) was established in June 1956. Its objective

[100] Sikkink, *Ideas*; and Baer, *Brazilian*.

was to achieve the production of 170,000 vehicles in 1960 (80,000 trucks and buses, 50,000 jeeps and light commercial vehicles, and 40,000 passenger cars). They moreover had to incorporate 90% of local content for trucks and light commercial vehicles, and 95% for cars and jeeps. The GEIA enjoyed absolute discretion in relation to the companies of the sector, being able to grant privileged exchange rates and credit. Like in Spain, the automobile market was closed to foreign production, but the licensing policy was more lenient and favourable to foreign investment.[101]

Kubitschek's government considered the automotive sector to be strategic, and direct foreign investment as a preferential channel to access the technology and capital required to promote it.[102] The GEIA approved 18 projects for the final construction of vehicles, of which 11 were finally viable.[103] The great majority of these brands were already established in Brazil, but until then had limited their activity to assembly, using low percentages of components of local origin. Starting from 1956, high degrees of nationalization were required in order to be able to continue in the country. From a comparative viewpoint, it can be considered that authorizing around 20 brands was risky to be able to take full advantage of the returns to scale characteristic of the industry. [104] However, irrespective of their final viability, it is worth underlining here that almost all the major worldwide manufacturers chose São Paulo and its surrounding area to locate new factories or expand those existing. This was the case of Ford, GM, International Harvester, Scania, Toyota, Vemag, Volkswagen and Willys-Overland. It is important to note that, in order to accomplish the new and more ambitious goals, Mercedes-Benz

[101] Orozco, *Indústria*; Nascimento, *Formaçao*; and Shapiro, *Engines*.

[102] *Ibid*.

[103] 154 projects to manufacture components were also presented. Anfavea, *Indústria*.

[104] Catalan, "Strategic policy revisited," 207-230.

quickly moved its factory from Rua Bela in the city of Rio de Janeiro to São Bernardo do Campo.[105] The only important exception was the already mentioned 'Fábrica Nacional de Motores', which assembled trucks at a rate of 200 units a month.[106] Simca was the only company which initially planned to operate on a large scale outside São Paulo, specifically in Belo Horizonte, the capital of Minas Gerais. Later, however, it also ended up choosing the São Paulo district.

Between his election victory and his investiture, JK travelled to the USA and Europe to present his developmental programme. While in France, Kubitschek visited the Simca factory, being enthralled by the facilities. The future president encouraged the French to establish a factory in Brazil, preferably in his native Minas Gerais. Simca do Brasil, in which the French had a minority stake, was founded in Belo Horizonte in May 1958, on industrial land provided by the governor of the state. However, when it began to operate in March 1959, it did so from a rented workshop located in São Bernardo do Campo, 800 kilometres away. The decision was taken by the second technical authority of Simca, who was in Brazil monitoring the operation. One year later, the Brazilian subsidiary admitted that its transfer to Belo Horizonte was unfeasible, as practically all of its almost 1,000 suppliers were located in São Paulo, including Ford, which supplied the engines.[107]

Volkswagen (São Bernardo do Campo), Willys-Overland (São José dos Campos and Taubaté) and Mercedes (São Bernardo do Campo) built modern new factories for the complete manufacture of automobiles. In particular, Kubitschek's insistence helped Volkswagen to complete the plan to manufacture its Combi, together with that of its star

[105] Latini, *Implantação*.

[106] Ramalho, "Estado," in *JK*, eds. Arbix and Zilbovicius, 159-179.

[107] Gattas, *indústria*; Shapiro, "Determinants of Firm Entry," 876-947; Latini, *A Implantação*.

product and mass-produced car, the Beetle *(Fusca* in Brazil)[108]. As occurred in Barcelona with the 600 model, for the cluster to expand it was essential to be able to have a cheap car for a relatively poor country. Also like the 600, the VW Fusca soon used 95% of national components, manufactured in Brazil[109].

Ford and GM, much more reluctant to intensify its production in Brazil, were likewise forced to change their attitude.[110] In March 1959, GM inaugurated a comprehensive Chevrolet engine factory in São José.[111] For its part, Ford built an engine stamping plant in the Ipiranga neighbourhood, next to its assembly factory which it inaugurated in 1953, installing the casting in the adjacent municipality of Osasco.[112]

The industrial policy promoted with the Plano de Metas favoured the final take-off of the São Paulo district. In 1961, the cluster's production was close to 150,000 vehicles (Table 4) which, moreover, included domestic content percentages above 90%, fully manufactured in the district.[113] Despite this, Kubitschek's government had to contend with the direct opposition of international institutions such as the IMF, with which it broke off relations in 1959.[114] The cluster had embarked on a path of development from which it would not deviate even with the severe crisis which broke out in 1962, or with the 1964 coup d'état.

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[108] Shapiro, *Engines*.

[109] Wolfe, *Autos*.

[110] Shapiro, *Engines*; and Wilkins and Hill, *American*.

[111] Gattas, *indústria*.

[112] Wilkins and Hill, *American*.

[113] Anfavea, *Indústria*.

[114] Latini, *implantaçao*.

Table 4

Production and employment in the São Paulo cluster: production (units) and workforce (number of employees) by manufacturer

	Production of passenger cars and light commercial vehicles		**Production of trucks and buses**		**Workers**	
	1961	**1974**	**1961**	**1974**	**1961**	**1971**
Ford	3,877	160,768	10,151	15,118	3,223	14,862
GM	4,079	162,207	9,610	19,991	4,687	11,184
Int. Harv.			1,024	n.d.	851	n.d.
Mercedes			6,993	37,546	5,081	9,264
Scania			491	2,550	645	967
Simca*	5,824	30,121		8,300	990	3,251
Toyota	7	639			92	411
Vemag**	11,008				3,089	26
Volkswagen	47,340	458,954			7,998	27,148
Willys***	42,601				6,874	
TOTAL	114,736	812,689	28,269	83,505	33,530	67,113

Source: Own elaboration from Anfavea, *Indústria*.

Notes: *Chrysler from 1967; **acquired by Volkswagen in 1965 and closed in 1967; ***acquired by Ford in 1967.

The military which seized power, initially led by Humberto Castelo Branco, did not change the automobile policy, although they moderated the expansionist stimulus of the democratic governments. Automobile production in Brazil, which had gone from less than 10,000 vehicles in 1956 to over 150,000 in 1964, exceeded half a million vehicles in 1971. By the middle of the decade, it reached around 800,000 units.

The evolution of the number of employees in the São Paulo cluster corroborates the development experienced by the Brazilian automotive industry. In 1971, the 67,113 workers employed directly by the end manufacturers more than doubled those of 1961 (Table 4). The ratio between the producers of parts and end manufacturers established in São Paulo was around 2 to 1, and it can therefore be estimated that, in 1971, the cluster gave employment to around 201,339 workers[115].

Brazilian production continued to expand rapidly in the early 70s. Given that the São Paulo's Region concentrated almost the entire automobile industry of the federation, by 1974 the cluster exceeded 100,000 direct jobs in manufacturers and was close to 200,000 in suppliers. Consequently, the size of the São Paulo cluster was significantly larger than that of the Catalan district.

As the cluster finally took off, it clearly fitted in with Markusen's category of a hub-and-spoke district. If we accept the figure of 201,339 workers employed in the cluster in 1971, just three big companies (VW, GM and Ford) already employed 53,194 workers. This would mean that the three leading firms concentrated 26% of the employment generated by the São Paulo automotive cluster. Although the relative weight of the three leading corporations in the São Paulo cluster was not as overwhelming as in Barcelona, the significant proportion suggests that the big companies of the industry provided the district with crucial capabilities for its final take-off. We should moreover take into

[115] Anfavea, *Anuário*.

account that, during the 60s, the big foreign companies increased their degree of control of the suppliers located in the São Paulo cluster[116].

Table 5

Employment generated by the leading companies and total employment of the São Paulo and Barcelona clusters

	1971		**1976**
Volkswagen	27,148	SEAT	27,053
Ford	14,862	Motor Ibérica	4,722
General Motors	11,184	ENASA	3,616
Three biggest companies	53,194	Three biggest companies	35,391
Employment of the São Paulo cluster	201,339	Employment of the Barcelona cluster	55,131
Weight of the three biggest (%)	26	Weight of the three biggest (%)	64

Sources: Own estimation from Anfavea, *Indústria*; and Catalan, "The life-cycle," 77-124.

Following the 1956 decrees, the car manufacturers sought to attract their international suppliers and, when this was not possible, they assigned manufacturing licences to local employers. However, when the costs of controlling the local suppliers were too high, they chose to internalize production, which was in turn a sign for the rest of the companies from the district. As the development of the sector intensified in the 60s,

[116] Shapiro, *Engines*; and Addis, *Taking*.

the trend was for local companies to be acquired by the big transnationals, which preferred this to opening new companies.[117] One of the sectors which evolved the most was the production of cast and forged products and the steel industry in general, spreading the benefits of its technological and organizational modernization to the overall industrial fabric of São Paulo. At the beginning of the 70s, this allowed most of the machines used in the automobile industry to be manufactured in the cluster, even the most complex such as those which operated the engine head.[118]

The district was apparently co-ordinated by the market, in which the end constructors could impose their conditions, although the trend was to increase control over the companies of the auxiliary industry. In its early years, the action of the GEIA, which had the power to temporarily suspend import licences, was biased toward the interests of the local automotive parts manufacturers. When the end constructors rejected the local parts alleging a lack of quality, the GEIA commissioned external appraisals, often from the São José Technological Institute, thus disciplining the big transnational companies. Taking advantage of its arbitration function, the GEIA fostered dozens of cooperation agreements between automotive parts manufacturers and constructors in order to encourage the transfer of technical and organizational knowledge, although it did not hesitate to foster joint ventures with international suppliers when the complexity of the production was beyond the reach of local producers.[119]

From the early 50s, the development dynamics of the cluster was characterized by a combination of local initiatives, together with the establishment of subsidiaries of big international groups. Sofunge, a company controlled by local capital and chaired by

[117] Shapiro, *Engines*; and Addis, *Taking*.

[118] Latini, *implantaçao.*

[119] Shapiro, *Engines*; Addis, *Taking,* and Latini, *implantaçao*.

Eduardo Simonsen, the son of the São Paulo industrialist leader Roberto Simonsen, cast engine blocks and manufactured engine heads even before the approval of the 1956 decrees. Its products also incorporated aluminium pistons forged by companies from the district, such as Roberto Klopel & Filho, Regemotor and Lugino Grandes, which, following the JK decrees, were joined by another two new companies, Metal Leve and Cofap. On the other hand, the manufacture of the first gearboxes required the installation of a subsidiary of the German ZF, while the large-scale production of forged parts experienced a huge boost with the establishment of Sifco, a subsidiary of the American Steel Improvements. Other historical companies from the district, such as Albarus, which sold transmission parts to Ford from 1949, and Filtros Mann, which produced oil filters, ended up being controlled by Dana Corporation and Tilterwerke Mann, respectively. Another example is Amortex, which supplied bumpers to VW and Mercedes-Benz and which ended up being taken over by the German Sacks GmbH in 1961. In the mid-60s, Willys took over Bongotti, a radiator manufacturer, while VW purchased Forchedo, an important smelting plant. However, the most important acquisition took place when Mercedes took over Sofunge, probably the strongest automotive parts company of the district under local control.[120]

In the mid-60s, the restrictive macroeconomic policy applied to control unbridled inflation hit the local manufacturers without access to the international capital markets particularly hard. The economic turmoil was taken advantage of by the big transnational companies, both end manufacturers and automotive part producers, to strengthen their control over the district's companies.[121] In this process, the subsidiaries of the end

[120] Gattas, *Industria*; Shapiro, *Engines*; and Latini, *implantaçao*.

[121] Shapiro, *Engines*, and Addis, *Taking*.

manufacturers hierarchized the cluster, at the same time as disseminating a large part of their technological and organizational capacities.

Although the local institutions continued to undertake important work, the weight of the small and medium-sized companies under local control gradually descended. In the 1960s, the manufacturers' associations worked to improve the capacities of the vehicle parts companies, offering their members technical assistance, mainly through the Technological Institute of Aeronautics in São José dos Campos.[122] They also coordinated with the region's higher education institutions in order to offer courses in metal working, mechanics and electricity, in addition to degrees and postgraduate courses in engineering, economics and business administration. Although their action helped to promote the cluster, as occurred in Barcelona, the strategic-type industrial policies were the decisive factor for its take-off. Once the policies applied promoted the development of the automobile industry, the latter reinforced its concentration in São Paulo to reap the competitive advantage generated by the abundance of skilled workers and specialized suppliers. The international companies which best adapted to the incentives established by the industrial policy ended up dominating the cluster and contributing decisive capabilities in order to strengthen their competitive advantage.

Conclusions

The Barcelona and São Paulo clusters originally emerged as a result of the presence of Marshallian-type external economies. Before the Great Depression, both districts were the most industrialized regions of agricultural-based developing countries. They had numerous mechanical engineering workshops and factories and an abundant

[122] Latini, *implantaçao.*

workforce used to industrial discipline. They also accumulated specific knowledge of the industry thanks to the establishment of constructors or assemblers such as Hispano-Suiza, Elizalde and Ford Motor Ibérica in Barcelona, and Grassi, Ford and GM in São Paulo. During the inter-war period, small workshops focused on the spare parts market moreover proliferated in both districts. In both cases, during the formative period of the cluster, the industry had the support of its own local institutions. Nevertheless, neither Barcelona nor São Paulo crossed the threshold of mass production before 1950.

The take-off of both clusters began in the 50s, thanks to the adoption of a strategic-type industrial policy. This included protected markets, different types of subsidies, the obligation to include high percentages of domestic content and a commitment to popular vehicles well adapted to the local market potential. The manufacturers that accepted these conditions provided production, management and distribution and marketing capabilities to both districts and they ended up becoming true cluster nodes. Although these policies were applied nationally, the bulk of their impact was captured by regions with a previous base in the art. In Barcelona, the prominent player was basically SEAT (FIAT holding a minority stake), although the contribution of Motor Ibérica (formerly Ford) and ENASA (formerly Hispano-Suiza) was also important. In São Paulo, the predominant role was played by Volkswagen, followed by Ford and GM, which ceased to be assemblers and became manufacturers.

These companies introduced mass production in both districts and thus permitted their expansion. The local business fabric was able to take advantage of the high percentages of national production required by the administration, although both clusters also experienced the arrival of foreign suppliers. To ensure the success of their international operations, the big end manufacturers transferred their organizational capacities to the companies of the district. Thus, the large mass production companies, at

the same time as strengthening the cluster's competitive advantage, structured it in accordance with their interests. Barcelona's 600 and São Paulo's *Fusca*, true people's cars, triumphed thanks to their low cost and their features and were manufactured with over 95% of national components. Both clusters evolved, adopting a very hierarchized structure around a few end constructors. To summarize, they were districts which conform well to the concept of hierarchical clusters.

Without a strategic industrial policy, the clusters in question would not have achieved the development that they experienced, and would certainly have maintained their character as mainly importers or assemblers. The strategic policy succeeded on encouraging big local companies or subsidiaries of multinationals which dominated the industry to contribute their technological, organizational and distribution and marketing capabilities to the development of the district, having a crucial impact on their take-off. The local institutions did not make a comparable contribution.

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