

The Challenges to Develop the Brazilian Automotive Supply Chain

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Abstract. The Brazilian automotive industry is working toward alternatives to protect itself from the international competition. The Brazilian government believes that the Program to Incentive Technological Innovation and the Competitiveness of the Automotive Vehicles Supply Chain (Inovar-Auto) to promote the technological development, improve the efficiency and increase the productive in the national automotive supply chain. The present study aims to identify and explore the opportunities and limitation of the program. It is based on public documentation and investigation of the competitive factors of the industry in developed countries such as Japan, Germany, USA, South Korea and then these factors are compared to Mexico and Brazil. The results show that Brazil is a user and not a developer of technology consequently the Inovar-Auto only benefits the foreign enterprises working in Brazil.

Keywords: Development Countries; Automobile Industry; Technology Innovation.

1 Introduction

Brazil has one of the biggest global markets for production and consume of automobile vehicles, and it includes cars, trucks, buses, agricultural machinery and a big highway network. This supply chain connects a range of companies such as manufacturers, suppliers of raw material, auto parts, distributors, motor fuel filling stations, insurance companies, auto shops, tire shops, communication and marketing companies, and others, and it also sustains millions of employs. In 2014, the sector, represented by 61 production units over 46 municipalities in 10 states, was responsible for 25% of Brazilian Industrial GDP, and 5% of the total, representing gains over US\$100 billions [1].

In 2012, the Brazilian government launched the Program to Incentive the Technological Innovation and to Consolidation of the Automotive Supply Chain (Inovar-Auto) that aim to improve the competitiveness, the technology and the security of the automobiles produced and commercialized in Brazil. The incentive to the innovation and to the technological development consists in provide to the selected enterprises to use a tax reduction for their industrialized products (IPI) [2]. However, despite the global development regarding the automotive technology, Brazil is considered as consumer of technology and not a developer. The automotive sector is an example [3].

This paper aims to investigate the mutual competitive factors that contributed to the development of the automotive industry, checking the relation of these factors between developed and developing countries, and finally verify the influence of these factors on the Brazilian automotive supply chain due to the influence of the Inovar-Auto, as well as the effectiveness and the strategy to achieve the goals of the program.

2 Methodology

The present research analyzes the evolution period of the automotive industry from 1990s to the present day. This period reflect the opening of the Brazilian market to international products and to the automotive industry.

We conducted an exploratory methodology in the present research based on literature review. In order to carry out this study we collected data from ANFAVEA annual catalog (National Association of Automobiles Manufacturers), reports from BNDES (Development National Bank: Automotive Sector

Overview: The Structural Changes), MDCI (Ministry of Development, Industry and International Trade), scientific publications from several countries, books, journals and specialized websites of the automotive sectors and others.

This research allowed to identify the competitive factors and to classify the automotive supply chain of the countries either as developed or developing. We classified the USA, Germany, Japan, and South Korea as developed countries due to their importance and influence in the industrial process of the Brazilian automotive supply chain. Both American and European enterprises such as Ford, GM, Volkswagen, Mercedes-Benz initiated this supply chain as well as their suppliers. Japan and South Korea were also considered developed once they started their industrial process at a similar period comparing to Brazil and for their influence in this sector. We selected Mexico and Brazil as developing countries for the similarity of their automotive supply chain, geographical location, similar colonization and dependence of international industry.

The discussion conducted in this article is focused on the similarities of the competitive factors in both developing and developed countries as well as the Brazilian proposal to boost the technological development, innovation, security, environmental protection, energetic efficiency and the quality of vehicles and auto parts due to the program Inovar-Auto.

3 World Automobile Industry

The international competition importance has increased considerable in every country since the economic globalization. The main mission of politicians is to make the country they represent more competitive as well as to increase the welfare of society. The enterprises are not able to be more competitive by their own. A competitiveness increment does not rely only on the industry efforts. In a global environment the increase of competitiveness of the national is vital. Therefore, the governments are responsible to increase the competitive advantage of industries offering the conditions for competitiveness. They must also be conduct policies to increase the competitiveness of each sector contribution to the competitiveness of the nation [4]. The automotive segment is an international oligopoly with several barriers to new incomers. It is possible to assume that the industry is in a permanent process of aggregation due to incorporations, fusion, joint ventures and commercial partnerships of several other ways, proving the oligopoly aspect regarding the sector [5].

3.1 Japan

After the Second World War, the Japanese institutions wisely instituted international trade policies and favorable exchange rate initiating new production paradigms, working force qualifications and reverse engineering. The development strategies demand coordinate actions in order to take advantage of opportunities. The connection among local, regional and global factors is always necessary. The financial and economic networks of the enterprises settled in developed countries and their interconnections among industrial policies, commercial and technological factors compound an instrument to build industrial and technological policies generating multiple effects [6].

Japan has developed a long-term relationship between manufacturers and suppliers based on cooperation, joint venture and integrated methods and processes [7]. Thus it obtained lower costs and continuous improvement processes that overpass the industries' border covering the supply chain and introducing the just in time [8].

Toyota, a Japanese automotive industry, invested on a lean production system. They use a low scale and flexible production, allowing productions in both small and large quantities. The great cost of raw materials demanded techniques to control the production in order to reduce losses along the supply chain. The inventories and associate costs, which demanded for complex logistic organization and a large number of employees, were eliminated. The use of workforce was replaced by capital and technology. The quality became vital to conquer new international markets. It was introduced the concept of a factor demanding small inventory, reducing losses, higher quality standards and flexible production [4].

This relationship started to influence the western producers since 1990s, and it initiated the purchase process and reorganization of the units specially created to select and develop the suppliers. It started to demand the adoption of lean production and management systems for the suppliers, and at the same time, they were mostly outsourced suppliers [9].

3.2 Germany

In Germany, the automobile manufacturers were aware to the conception processes, assemblage, distribution and auto parts manufacturing. The technological strategy maintained the production of higher value compounds, for example, engines, gearbox, and heavy fabric parts and it outsourced the other parts [3]. This behavior is a reference among the best practices, and it started a new and promising area, the Supply Chain Management [8].

The automobile manufacturers also aimed to identify the main suppliers and set them as first level suppliers, the exclusive suppliers to their main compounds. These suppliers were contracted to develop an automobile from the project and they should settle a production unit close to each manufacturer plant. Thus, a few car manufacturers established small “non-technical” research groups as part or partners in the larger technology oriented research and advanced engineering units (e.g. Daimler, General Motors, Toyota, Volkswagen, BMW, Audi, Nissan). This was grounded in the insight that the long-term success of an automotive company doesn't only depend on the successful management of the core functions of automotive value creation (procurement & supply, engineering and vehicle development, manufacturing, marketing & sales), but also requires that long term development in the “non-technical” spheres of the business environment, in markets and society, have to be taken into consideration [10].

As can be seen in Figure 1 the need to know the business environment trends shaping future markets and contexts for the automotive industry and mobility business, and what challenges these pose.

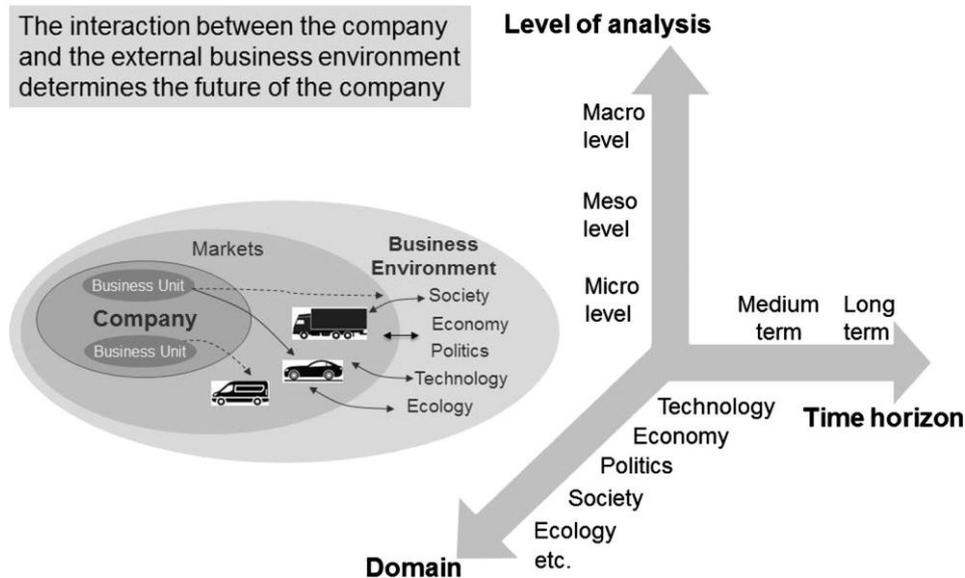


Figure 1: Basic approach of the Society and Technology Research Group [10].

3.3 The USA

The USA followed a similar strategy used by Germany. Beside these strategies, the manufacturers initiated to not use foreign suppliers (offshore-sourcing), and consequently the intensification of the Just-in-Time and mutual development of the product [8].

In the 90s, the new global strategy contributed to the creation of the global automobile due to global sourcing. The manufactures use this strategy to supply automobiles globally to fulfill the quality and price requirements [9].

In today's global economy, there isn't an easy way to determine where a car is made. Many cars built in the U.S., for example, are assembled using parts that come from elsewhere. Some cars assembled in the U.S. from largely American-made parts don't sell well, meaning fewer Americans are employed to build them. Domestic-parts content stems from Congress' 1992 American Automobile Labeling Act, which groups the U.S. and Canada under the same "domestic" umbrella. It's one of the bill's imperfections, but

the AALA is the only domestic-parts labeling system car shoppers can find on every new car sold in America. Other domestic-content ratings namely those used for the North American Free Trade Agreement and the corporate average fuel economy programs are unpublished, give a simple over/under indication or lump even more countries, like Mexico, into the "domestic" pool [11].

3.4 South Korea

The developing of industrial process in South Korea used technological knowledge to create products and innovative processes that are evolving constantly. This rapid development regards high investments in both physical and human capital, entrepreneurship, venture assumptions, efficient learning and innovation. These skills over passed the level of efficient users of advanced technology (know-how) to a more complex production level, acquiring a self-innovative posture (know-why) [12].

The success is a result of several aspects such as: receptivity to international knowledge, availability for connections to technological international markets, the pressure for productivity and the increase of international technological productivity regards capacitating of the workforce. All these factors guaranteed the success of the technological development [12].

3.5 México

Mexico, after the 90s, especially 1994, has intensified the renovation of its automotive industry due to the North American Free Trade Agreement (NAFTA) [13].

The joint ventures were responsible for the process. Foreign investors provided most of the investments, mainly USA, followed by Japan, England and Canada. They comprehend international consortiums that follow the global restructuring of the industry. Investments are made closer to the markets. The sells in the domestic market are biased to producing plants OEM (Original Equipment Manufacturer), international quality certified suppliers of 1st or 2nd level.

The group compounded by small and medium companies has different characteristics. Its investment is 100% national, excepted in two situations, when the investments come from the USA and Japan. Its production is biased to the national market, excepted for the two mentioned situations [13].

The companies that do not participate in large corporations do not have the benefits of established contracts from the countries where the producers or suppliers are established. The process of restructuring of the automotive industry is led by large enterprises that participate in joint ventures [13].

3.6 Brazil

In Brazil, the national automotive sector is part of the global changes in a scenario named as globalization. The recovery and the opening process of national economy made the Brazilian market more attractable to the international automotive industry.

The manufacturers in Brazil followed the international trend and they began a transformation process, changing the relationship to their local suppliers. According to their countries, the manufacturers incorporated hierarchical command strategy, such as follow sourcing, single sourcing or different variations [9; 14].

The follow sourcing and single sourcing policy establish a partnership to the supplier. The follow sourcing assists the supplier that follows the manufacturer wherever its production plant is located, making them responsible for the products development and to provide the more important systems. The single sourcing is the policy where each supplier is the only responsible for a specific part, increasing the supplier responsibility for the competitiveness of the final product [15].

These policies are unlikely to the Brazilian auto parts manufacturers due to great investments necessities. Mostly of national auto parts manufacturers were not able to be a first level supplier. They were downgraded to a second level or acquired by global enterprises, leading to an aggregation and a foreign control over the production [9; 16].

This change has consolidated the presence of the biggest enterprises in Brazil. Only eight, among the 50th biggest auto parts multinational enterprises, are not producing in Brazil [8]. However, there are also a few manufacturers that are still controlled by national investors. They are first level suppliers to the

automobile manufacturers, and in some cases, they are global wide [9]. This policy has influenced the auto parts sector, reflecting the negative trade balance, as can be seen in Table 1.

Table 1: Trade balance of Brazilian automotive industry. Source: Adapted from ANFAVEA (2015)

Year	Imports	Exports	Balance
2001	3.717*	3.614*	(67)*
2002	3.483	3.959	476
2003	4.020	5.641	1.621
2004	4.750	8.383	3.633
2005	6.191	11.442	5.251
2006	7.150	12.308	5.158
2007	10.327	13.461	3.134
2008	16.372	14,010	(2.360)
2009	12.459	8.318	(4.141)
2010	18.247	12.843	(5.404)
2011	24.301	16.230	(8.071)
2012	23.942	14.600	(9.342)

*Values in US millions

In the last five years, a strong increase of the trade balance of the automobile and parts industry produced in Brazil doubted the future of the national automotive supply chain. As an attempt to revert this scenario, the federal government initiated a process to divulge the Act no 7.819 issued in 10/03/2012, creating the Inovar-Auto covering the period from 2013 to 2017 [17].

The Program aims to support the technological development, innovation, safety, environmental protection, energy efficiency and the quality of parts and automobiles [17]. It allows the financial incentive to produced and commercialized automobiles according to global technological trends. It also provides a tax reduction up to 30% of industrial products for the manufactures that fulfill the requirements in the legal act. [2].

Fifty-five licenses were provided to 23 selected manufactures, 15 importers and 17 investment projects, which must be renovated annually. A technical commission of the Department of Industry, Equipment and Transport, Secretary of Production Development and Legal Advice audit the enterprise in order to renovate their license [17]. The Inovar-Auto Program is not a close program. It compounded by law and legal acts that are under constantly evolution.

Among the participants, there is a Working Group integrated by several players from the sectors as: ANFAVEA – National Association of Automotive Producers; MDCI – Ministry of Development, Industry and International Commerce; MCTI – Ministry of Science, Technology and Innovation; AEA - Brazilian Association of Automotive Engineering; USP – University of São Paulo and others. This work group develops the concepts and rules for the program. It also acts to: prepare a manual to facilitate the analyses and classification or P&D development projects or engineering, and to elaborate the auditing requirements to renovate the licenses.

The vehicles manufacturers announced investments around US\$ 22.3 billions as counterpart for the benefits provided the Inovar-Auto, in the next years. An amount of US\$ 2.3 billions is dedicated to industries to build new production plants in Brazil such as Audi, BMW, Jaguar Land Rover, Chery, Foton, Jac Motors and Sinotruk. The current working plants will invest US\$ 20.0 billions to install new plants, new assembly lines to increase their production, modernization of working assembly lines, production of engines and component, releasing new models of vehicles, nationalization, improvement and development of new products, creation of R&D centers and others [17]. A percentage of 98% of the investments will come from international enterprises, and only US\$ 500 millions (2%) from national enterprises: Agrale, Volare e MMC Automotores do Brasil (fábrica licenciada da Mitsubishi de propriedade do grupo MMC Automotores do Brasil).

A review of the government proposition is premature, but is possible to observe the repercussion of the program. Toyota, for example seeks to nationalize 65% of Brazilian motor, to be produced, with an expectation of attracting 19 new suppliers and producing nationally parts such as block, cylinder head and crankshaft. The new project comes as a direct response to the Brazilian industrial policy, which until the initiation of the new regime, did not demonstrate any interest in fabricating motors in Brazil, even it is the

fourth biggest importer of the country, importing 2.5 billion dollars and with a trade deficit of 1.7 billion dollars [18].

Another initiative with the Inovar-Auto program as be made by Cummins. Most of the car motors sold in Brazil are imported from China and receives only minor national contributions. The focal point before the new automotive regime was always the lowest cost and, often, the nationalization ceased to be a good option. Now the company seeks to offer products and components (turbochargers and after-treatment systems) with a higher domestic content [19].

The Program Inovar-Auto protects the profit of inefficient car makers. So far the program brought no solution to the lack of competitiveness of the domestic automotive industry. After its first year of operation, the Brazilian government program, which aimed to increase technological inclusion and competitiveness in the domestic automotive industry, did not solve the efficiency problem. Production costs remain as high as ever, above the main competing countries, and the productivity continues to worsen [20].

5 Discussion and Conclusions

The studied countries categorized as developed have several similar competitive factors, such as: national majority control for producers and suppliers; entrepreneurship and risk assumptions; use of advanced technologies (know-how); innovative skills (know-why); open to foreign knowledge; connection to international markets and technologies; well succeeded workforce capacitation; technological development success. On the other hand, the developing countries have exogenous industrial automotive plants and dependence of the international, technological development and production management system. The suppliers have difficulties in generating investments for modernization and do not develop technology, and as a consequence belong to the 2nd and 3rd levels of the supply chain. Their products are mainly to supply the local market. They are constituted of small and medium enterprises focused on operations. The international manufacturers make connections mainly to their original suppliers and strategic partners in order to optimize their profits.

The results regarding the program Inovar-Auto can be observed due to the generation of investments around US\$ 22.3 billions in the automotive sector in the next years to build new production plants, modernize working plants and to increase their capacity, producing engines and components, releasing new vehicles, nationalization of vehicles produced locally, improvement and development of new products, and others.

However, only 2% out of US\$ 22.3 billions will be invested by national enterprises. The program Inovar-Auto has showed no sign in order to promoted the technological inclusion of Brazil in the global scenario. Therefore, the greater the national production, the greater the consumption of international parts.

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