19th International Colloquium of Gerpisa

8 June, 2011 – 10 June, 2011

THE SECOND AUTOMOBILE REVOLUTION IS ON THE WAY?

Theme 4. Technological transformations, systemic transformations.

The technological development of the auto industry in Mexico [1]

Martin G., Victoria Ma. A.*

Introduction

As pointed out by CEPAL [2009: 17], the automobile industry is a key sector for most countries and has led to innovations "that have radically transformed a large number of manufacturing processes".

This industry is driven by multinational enterprises (ME) that compete globally and have played an important role in the regionalization, carrying out a process of relocation of production to emerging countries "combining large domestic markets with lower production costs and proximity to important export markets" [CEPAL, 2009: 17].

For countries it is a very important industry because generates employment, investment in machinery and equipment of high technology and allows acquiring and developing technology, benefiting countries with the wealth they generate. As pointed out by CEPAL [2009: 17], this industry produces more than 50 million vehicles, 10 million direct jobs and 50 million indirect jobs, using goods produced

[1] This research is part of the Project "competences and strategies of the participating industries in the production chain of the automobile industry in Mexico and China", with the financing of DEGAPA from the National Autonomous University of Mexico, PAPIT IN 308708.

*Professor at the National Autonomous University of Mexico.

by other industries such as steel, aluminum, glass, plastic, rubber, electronics and textiles, and "becomes an activity that articulates a complex production chain ... to play a key role in the industrialization of many countries".

Even though in 2009 Mexico ranked tenth in the world as a producer of vehicles, which represented 2.55 percent of world production, with 1,557 thousand units, as far as development of technology for the automobile industry, nor the government or the enterprises have done anything to create new technology, especially in new forms of energy and materials to save energy and costs.

For the development of the present work a survey was realized to a sample of 31 companies of auto parts: ten of them located in the State of Puebla, 13 in Aguascalientes and eight in the State of Mexico. The selection of the sample was realized in a random way and was based in the list of companies inscribed in the National Industry of Auto parts (INA) For the raising of the survey, questionnaires were elaborated with opened and closed questions that included the aims of the project. The information obtained of the questionnaire was complemented itself by depth interviews to managers of the polled companies.

This article is organized in the following way: the first part presents some concepts about the multinational enterprises (ME) mentioned in Dunning's eclectic theory, the concept of foreign direct investment and the benefits that can be obtained by the country who receives it like the case of Mexico. In the second one, an analysis is realized of the answers that gave thirty one enterprises interviewed of the of auto parts industry in relation with the capital´s origin, competitive advantages, weaknesses of Mexican suppliers, characteristics of their technology and the partner who provides technology to them. In the third part some considerations and conclusions appear.

1. The multinational companies and the foreign direct investment

Based in Dunning's eclectic theory [1977, 2000: 163:164], known by its initials in English OLI (Ownership, Localization, Internalization) that establishes that the production of the ME out of his country is determined by the interaction of three independent variables. The first one is the competitive advantage (O) of the ME; the second one is the location (L) of the countries or alternative regions and, the third one offers a frame of reference to evaluate the alternative forms in which it is possible to organize the creation and exploitation of his competitions. Finally the eclectic theory establishes that the precise configuration of the OLI it is fundamentally contextual, and particularly, it will reflect the economic and political aspects of the country or region where there will be realized the foreign direct investment (FDI).

Dunning and Zhang [2008: 1] analyze the role played by the resources, capacities, markets (RCM) and the institutions (I) as the principal ingredients of the national economies and their association with the (FDI), affirming that exists a causal relationship between the FDI and the competitiveness of the country where they will invest. The authors indicate that the ME, based on the intention of their investment the RCM for that they look changes depending on the aim of the investment.

Based in the OLI theory it can be affirmed that the assembly companies and the ones of auto parts that were established in Mexico they were possessing competitive advantages in relation with the few Mexican existing companies that were making auto parts, because the Mexican companies mentioned did not have the investment capacity in machinery needed by the industry, neither the suitable technology nor the necessary capital -besides of the barriers to be able to enter-, for what was more beneficial for the ME to exploit their advantages than yield them.

Due to the nearness with the American market, the commercial opening, the signature of the North American Free Trade Agreement (NAFTA) and the

abundance of cheap workforce it turned out to be beneficial for the ME to install plants of auto parts, which not only would produce for the domestic market but for that of export (The United States and Canada principally), taking advantage of the fiscal programs of factory-works (maquiladoras) and the one of highly exporting industries, with which the imported inputs destined for the export do not causes the VAT nor the importation taxes. In addition, the governments of the different Mexican States offered them facilities to install their plants, as it was the case of The State of Puebla [Martin, 2010].

As Amatucci and Mariotto indicates [2010], the decade of the nineties brought a revolution in the automobile industry characterized by an integration of the productive system and the common strategy was to produce near the markets where the cars are commercialized, as well as the adoption of the productive system of volume and diversity across common platforms to a group of different models.

Weber and Camuffo [2010] indicate that a form of integration has been through the outsourcing, which appears as a concrete interaction between the buyer and the supplier to define and to elaborate the component. The automobile industry, as many other industries, they have left to their suppliers many of the labors that before were realized in the assembly plant as the design, the development and the components engineering. The outsourcing gives to the participant companies some benefits as: "the combination of different competitions, to share the fixed costs and economies of scale", as it is established in the Transaction Cost Theory [Coase, Williamson and North].

Generally, the assembly plants need, at least, their suppliers Tier 1 and Tier 2 to follow them to the countries where they build their plants, especially if in the country that they establish themselves, there are neither suppliers nor highly qualified personnel, using only the local suppliers that can comply with their requirements of quality and competitiveness.

The strategies used in Mexico to attract the ME and consequently the FDI were: i) the commercial opening, ii) the liberalization of the financial markets; iii) the privatization of Mexican companies owned by the State; iv) the modification of laws to allow a major FDI and, v) the signature of commercial agreements, basically the NAFTA.

In Mexico, the commercial opening attracted the ME of the automobile industry which saw the opportunity to establish industrial plants in Mexico to take advantage of the nearness with the American market and the possibility of a cheap workforce that would bring, as consequence, major profits to the ME.

The FDI, according to the Conference of the United Nations on Trade and Development (UNCTAD), "has the potential of generating employment, increasing the productivity, transferring specialized knowledge and technology, increasing the exports and contributing to the economic long-term development of the developing countries " [UNCTAD, (a)]. In the case of Mexico, the average of the FDI from 1995 to 2005 was 17,470 million dollars (md), for 2006 it was of 19,946 md; in 2007 of 27,440 md, in 2008 of 23,683 md and in 2009 of 12,522 md, which represented the following percentages of formation of fixed capital: 16.2, 11.9, 9.2 and 6.1 per cent respectively [UNCTAD (b)].

The fall of the FDI in 2009 was due to the financial crisis initiated in 2008 and it was 2009 the first time in ten years that Mexico went out of the list of the 20 nations with mayor entry of FDI, going down from the 19th place to the 25 [El Economista]

In Mexico, the FDI in the automobile industry has been of 156.3 md in 2003, 2,466.8 md in 20004, 2,079.3 md in 2005, 1,419.9 md in 2006, 1,891.8 in 2007 and 914.9 md in 2008 [INEGI, 2009: 303].

Despite of the fall of the FDI in 2009 due to the financial crisis initiated in 2008, the UNCTAD foresees that the developing countries and the emergent economies will receive a major FDI which already represents 50 per cent of the world total [UNCTAD, 2010a: xix]. The UNCTAD projected Mexico in the sixth place as one of the most attractive country for the location of global business, after China, India, the United States of North America, the Russian Federation and Brazil.

For Mexico, one of the advantages of the commercial opening and of the FDI was the fix capital formation in the automobile industry. This fix capital formation grew from the entry into force on the first of January, 1994 of the North American Free Trade Agreement (NAFTA), this way in 1993 the investment was 1,929 million of pesos (mp), in 1998 of 11,254 mp and for 2003 it was of 15,598 mp[2] [INEGI, 2009: 28], which means that the opening of frontiers and the NAFTA improved the FDI in Mexico.

Another advantage has been the number of jobs generated. According to INEGI [2009: 30], between 1998 and 2003 the jobs generated in the automobile industry doubled; in this way in 1998 the number of employees were 230,712 including 43,913 belonging to the manufacturing of rubber products and for 2003 the employees were 495,476 including 32,727 of the manufacturing of rubber products.

From total production, in average 75 per cent it is exported (see table number one), being directed to the United States market, which implies a great dependence towards the American economy. This also gives an idea of the small size of Mexico´s market; on the other hand, many of the cars sold in Mexico are imported because they are not produced in Mexico.

[2] This FDI represents approximately: 154 million of dollars (md) in 1993; 900 md in 1998 and 1,246 md. in 2003.

Table 1
Production volume and exports
(Units)

	2003	2004	2005	2006	2007	2008
Total	1,585,982	1,509,134	1,688,177	2,068,923	2,105,789	2,180,294
Export	1,170,203	1,042,236	1,192,850	1,556,598	1,623,963	1,665,133
% of export	73	69	71	75	77	76

Source: INEGI [2009] La industria automotriz en México, p. 44

2. Analysis of answers of the interviewed companies

From the 31 interviewed enterprises: ten in Puebla, eight in the State of Mexico and thirteen in Aguascalientes we will analyze the enterprises capital´s origin, competitive advantages of the auto parts industry, Mexican suppliers´ weaknesses, characteristics of their technology and technological partner.

2.1 Enterprises capital´s origin

Not only the assembly plants are subsidiaries of foreign ME, but many of their suppliers of auto parts.

From the 31 companies of auto parts interviewed in Puebla, State of Mexico and Aguascalientes, 23 of them answered to be subsidiaries of foreign companies, which represented 74 per cent of polled companies. On the other hand, from the total companies of auto parts interviewed, in 21 their capital was 100 per cent foreign, in 9 of them was 100 per cent Mexican and a company had mixed capital (see table number two). That is to say, of the sample selected for the auto parts industry, only 29 per cent belongs to Mexican capital. That gives us an idea the small quantity of Mexican capital invested in the auto parts industry which, among other things, it carries profits to go away to foreign countries.

Table 2
Enterprises capital´s origin

Concept	Puebla	Estado de México	Aguascalientes	Total enterprises
Foreigner's subsidiary	8	6	9	23
Capital's origin 100 % foreign 100 % national Mixt	 7 2 1	 6 **2**	 8 5	 21 9 1
Total enterprises	10	8	13	31

Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Vera, Fernando.

2.2 Competitive advantages of the auto parts industry

In reference to the competitive advantages, the interviewed enterprises indicated that their principal advantage is the quality, secondly the design and finally the technology used and the time of delivery (see table number three).

Because the suppliers of the auto parts industry are subject to conditions and requirements that the assembly plant demands as: quality controls, certifications, flexible production, sufficient financing to comply with the program just in time, among others demands, which conveys a great capital investment, expertise and technology required are some of the reasons that explains why there are so few Mexican enterprises (see table number two)

Table 3
Principal competitive advantages

Principal competitive advantages	Number of companies that answered		
	Puebla	Estado de México	Aguascalientes
Quality	6	8	12
Price	3	3	6
Technology	4	7	6
Design	5	5	4
Time of delivery	3	5	6
Service quality	4	8	2
Maintenance cost	1	2	0
Technical support		1	
Plant location			2
Global strategies			1
Total enterprises	10	8	13

Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Vera, Fernando.

2.3 Mexican suppliers´ weaknesses

Assembly enterprises are very demanding for choosing suppliers because they have to fulfill with several requirements like enough capital investment, technology, quality, equipment design and product development. On the other hand, the assembly enterprises put on competition their suppliers in order to achieve the best conditions in prices as well as in delivery time and quality, which it carries out for suppliers to have advanced information systems to calculate their costs and control them, as well as process systems to avoid mistakes in production.

As far as to the response related to the Mexican suppliers weaknesses, the interviewed businessmen indicated the following: i) lack of technology, innovation and TIC’s; ii) they do not invest in machinery; iii) their prices are high; iv) low

quality and productivity; v) they do not have seriousness for deliveries; vi) they do not possess financing and, vii) weak design and development.

Due to the change in the industry organization, from a vertical integration to a horizontal one, nowadays the auto parts companies compete with the competitiveness of their chain [Deloitte, 2010: 10]. In this respect the Mexican suppliers (according to the survey) are not competitive; therefore they do not belong to suppliers of Tier 1, 2 and 3.

2.4 Characteristics of the technology and technological partner

Because of the financial crisis, the search on alternative energies, the competition between the assembly enterprises to create new models to fulfill the needs of different consumers and markets, the price rise of raw materials and energy, among other aspects, convey companies to seek to reduce costs and to create new products and for it technology and innovation play a basic role.

Technology and innovation is a very important topic for the enterprises' strategies, especially in this time of globalization and competitiveness, and the automobile industry is not the exception.

Foreign companies do not realize research and development in Mexico, this is carried out in other countries (generally in the country of the parent company), which indicates that the foreign companies settled in Mexico only utilized the workforce and some inputs, because the majority of inputs are imported. By the same token, the administrative systems also are provided by the parent company (see tables´ numbers four to eight)

As far as technology and technological development of the suppliers, we found that the technological partner is foreign; it is to say, the foreign capital

companies located in Mexico do not realize investigation, technological developments and innovations in Mexico, because it is carry out abroad (see table number four) and applied in Mexico.

If the foreign enterprises do not invest and realize research and technological development in Mexico, that puts Mexico in disadvantage in relation with other countries, besides the fact that the value added in the production process is very low, since the inputs used in the auto parts production, in a great proportion, are imported.

Table 4
Technological partner nationality

	Puebla	Estado de México	Aguascalientes
USA	3	1	3
Canada	1		
Germany	1		1
Japan			3
European Union			1
Do not have	3	2	3
Did not answer	2	5	2
Total enterprises	10	8	13

Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Vera, Fernando.

To the question about the number of employees working in Mexico on research and technologically development, the answers were: (see table number five)

Table 5
Number of employees realizing research and development

No. of employees	Puebla	Estado de México	Aguascalientes
35		1*	
30	1	1	
20	1		
12			1
8			1*
3	1*		

*Company with 100 % Mexican capital
Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Vera, Fernando.

From the total of company´s polled, only 22 per cent of them realized research and development. As for the enterprises with Mexican capital owned, only one in Puebla declared to have 3 persons working on research and development; one in the State of Mexico with 35 and another one in Aguascalientes with 8 employees working on research and development.

As for the enterprises with foreign capital owned not all of them have employees working on research and development. As for the companies located in Puebla, only two of them have employees working on research and development; for the State of Mexico, only one company has employees working on research and development and, finally, in Aguascalientes from thirteen companies interviewed only one had employees working on research and development. As it was mentioned previously, in the companies owned by foreign capital the research and technological development is done abroad.

It is necessary to mention that from ten companies interviewed in Puebla, seven are 100 per cent foreign capital owned, two are 100 per cent Mexican capital owned and one with mixed capital: 70 per cent Mexican and 30 per cent foreign capital owned. From the eight companies polled in the State of Mexico, only two

were 100 per cent Mexican capital. Finally, from the thirteen companies interviewed in Aguascalientes, eight are hundred percent foreign capitals.

The majority of Mexican companies do not invest in research and technological development. On the other hand, for the ME could decide to establish departments of research and technological development, it is necessary for them to be able to find highly qualified human resources to develop the products that are needed in the local and international market.

As for the characteristics of their technology, the majority of the companies answered that it was modern and of top (see table number six), though the majority of the technology is provided by the parent company or it is acquired abroad.

Table 6

Technology characteristics

	Puebla	Estado de México	Aguascalientes
Modern	5	4	8
Of top	3	2	4
Modern and of top	2	1	
Slowed down		1	1
Total enterprises	10	8	13

Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Vera, Fernando.

It is known that FDI is a source of technology transfer. In Mexico, the technology transfer has been very limited because it has only been referred to technical assistance related to product quality and production organization. On the other hand, the technology transfer is realized across the copy and finally across personnel training.

As for innovation or technological development realized in the last five years, the interviewed companies indicated that most of the innovation and development refers to the production process and product design. None of the interviewed companies has patented in the last five years, which confirms that the technological developments and innovations are not realized in Mexico (see table number seven).

Table 7

Innovation and technological development in the last five years

	Puebla	Estado de México	Aguascalientes
	Innovation		
Productive process	6	4	6
Product design	4	3	4
Product packing	3		3
Commercialization	4	2	1
	Technological Development		
Productive process	1	3	3
Product design	1	1	1
Product packing	2		2

Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Vera, Fernando.

The form in which the interviewed companies incorporate technology in their products or processes, in most cases, is across the one that provides the parent company. The supports that the companies receive from the supplier or the parent company are: training, technological advising and quality products improvement, financing and provision of machinery and equipment.

Secondly, the transfer of technology is realized across the development of suppliers, thirdly it is realized across the copy and adjustment and, finally only two companies indicated to create their own technology (see table number eight).

Table 8

Methods to incorporate technology into the company

	Puebla	Estado de México	Aguascalientes	
Copy and adjustments	2	4	1	
Licensees	1		2	
Supply's development	3	2	3	
Provided by the parent company	6	4	8	
Create their own technology		1	1	
Others	1		1	

Source: Information from the survey realized by the team that took part in the Project and it was processed by Simon, Nadima, Flores, Ma. Elena and Smith, Fernando.

None of the interviewed companies had projects neither with educational institutions nor with investigation centers to realize joint projects for advising or technical assistance works.

Among the problematic founded about lack of research and development in those companies with a 100 per cent Mexican owned capital, rests on the lack of entailing between the supply companies or factory-works with the big auto parts manufacturing plants.

Another reason for lacking research and technology development transfer it is due to the activities realized by some companies that are those with intensive use of labor force with little knowledge required to develop the work.

An impediment for research and technological development is the lack of financing by commercial banks and public policies for financing research and technological development.

The EM carries out most of the intensive processes in knowledge, either in his parent company or they contract institutes or investigation centers located in The United States, Japan and the European Union, principally.

4. Final remarks

Mexico has not dedicated sufficient resources to research and technological development (near 0.4 per cent of the GDP). According to CEPAL [2009: 64] the FDI in Latin America, 27.64 per cent was for Mexico (between 2003 and 2009), concentrating Chile, Brazil Argentina and Mexico 87 per cent of the FDI. Nevertheless, the sectorial destination went to the industry of software and information technologies. "Most of the FDI is by average of a weak technological intensity" [CEPAL, 2009: 66]

Mexico has not implemented public policies to possess highly qualified human resources, which would bring, as consequence, the creation of value in the auto parts industry and the generation of major income for the country.

The technology used in Mexico in the auto parts industry, in most of the cases, is developed abroad: The technology transmitted by the parent companies to their subsidiaries in Mexico consists on process improvement and product design, but neither the Mexican government nor the companies are doing anything for developing new technologies related to the substitution of fuels derived from the oil or the use of light materials to save fuel.

In Mexico, there has been neither an industrial policy nor a fiscal one to stimulate the acquisition of new technology and machinery of last generation to make Mexican auto parts industry to be able to compete with foreign companies.

In spite of the fact that Mexico possesses investigative centers, the investigation that is realized in them is not linked to the technological development of the auto parts industry. By the same token, there is not collaboration between the investigative centers, the institutions of top education and the auto parts industry.

Deloitte [2010:3] indicates that global competitiveness in manufacturing is going for a transformation that will change the trends of economic growth, the creation of value, national prosperity and national safety, for what the countries face a competition to create opportunities to innovate, to construct a highly qualified labor force and to improve the standards of life. The study indicates that the principal forces that will play in the world competitiveness will continue being the labor force, the raw materials, the energy and the public policies. In relation with the labor force it is demanded that this one must include investigators, scientists and engineers, all of that to bear upon innovation [Deloitte, 2010: 7]

About Latin America Deloitte's study [2010: 12] establishes as principal drivers for the competitiveness: i) the quality of the physical infrastructure, ii) talent and innovative competitiveness; iii) cost of the energy and public policies, iv) economy, trade, financial and fiscal system, v) cost of the workforce and raw materials, vi) legal and regulative system, vii) government investment in manufacture and innovation, viii) quality and system availability of health, ix) network of suppliers and x) local business dynamics.

Mexico is far away to reach these drivers for competitiveness, especially in reference to talent and innovative capacity, cost of energy and public policies, government investment in manufacture and innovation and the network of suppliers.

Mexico only put his eyes in the markets of the United States and Canada, whereas other countries did it on the world market. Mexico government opened his

borders abruptly, there was not a public policy for production of automobiles that were fulfilling the requirements of his internal market, he did not promote the technological development, he did not pay attention for creating the engineers and technologists that there were needed in the industry, as well as the research centers related to automobile industry.

As a consequence of depending on the American market the crisis initiated in 2008, as CEPAL [2009: 20] indicates:

> " In Mexico the abrupt and violent contraction of the American market and the difficulties of the big manufacturers of Detroit … revealed the weaknesses of the model, … .because of the high dependence to the American market and the difficulties to place the production on alternative markets, a production very concentrated in cars of major size for export, the existence of models that register a marked decrease in sales in recent period and an internal dismantled market, with scarce dynamism and lack of regulations in quality terms, which it could not have been a solid and reliable option for production … and the local demand it is covered mainly with imports "

If Mexico do not creates a highly qualified population who could have income bigger than four minimal wages, (this is the average perceived by 60 per cent of the population, approximately 5 dollars a day), it will not be possible to create well-being, the systems of pensions will not be able to grant worthy pensions and the government will have to move the retirement age to major ages. Mexico must promote the technological development to create better remunerated employment and to take major income from the exploitation of patents.

The world is moving towards the alternative energies. Europe has a plan of substitution of the internal combustion engine of petrol for the reduction of the CO^2, increasing of parallel form, in the short term, the technology of the hybrid cars as a

way of coming to the electrification, the increase of biofuels, the natural compressed gas and the gas derived from oil. For the medium and long term the vehicles based on batteries (including the hybrids) and the ones moved by hydrogen [European Commission, 2008: vi]. Also more light materials are developing for saving fuel and smallest engines for the same effects.

China wants to turn into a major producer of electrical vehicles. In England is based the Development Center for Electrical Vehicles with the vision of becoming a world leader into research and development for the industry and has been chosen by Nissan as parent plant for production of electrical cars in Europe [Ultra low coal vehicles]. The United States are investing also in the development of electrical and hybrid cars.

As Consoni and Bernardes [2010] indicates the reorganization of research and technology development in the auto parts industry has moved from countries like The United States, Japan and Europe to countries of emergent economies as Brazil, China, India and Russia, since this involves an important source of creation of value and saving in costs. "This way some assembly plants and their accumulated competitions in design suggest the possibility of becoming into partners of his parent company into the global development of products " [*Ídem*].

Due to the fact of having departments of research and development for some companies is not possible due to the costs that this can represent, for it there can be created research centers and development related to the auto parts industry which actors will be the universities and existing investigative centers in the zones where the assembly plants are set; in this way, the cost of research and development will be reduced for the enterprises.

Mexico needs a major formation of human resources in research and development. Top educational institutions must create specific courses to prepare engineers, designers and administrators (among others) needed by the automobile

industry and they most create an entail with enterprises. This would generate transfers activities from ME with major technological complexity, beside investing in research and development in the host country. As CEPAL indicates:

> " … for industry development will not be enough to reinforce the production capacity, but also it will be essential to strengthen the technological capacity and innovation, taking advantage of the existing engineering capacity …., by means of the extension of the internal expense in research and development and in the production of new vehicles designs to a local level ". "A major capacity of technological development will be decisive to increase the long-term competitiveness of the regional production and fit it rapidly to the new technological solutions to turn more efficient the industry in economic, energetic and environmental terms ". [CEPAL, 2009: 20]

Jeremy Rifkin indicated on October 8, 2009 in Brussels that the world is on the verge of a new "third industrial revolution" derived from the combination of investigation, development and technologies and the production of renewable energies. On the other hand, Michel Freyssenet indicates that the "transition to a safer and less pollutant car will modify the conditions of mobility and life in general, allowing the auto mobilization of new populations and shaking the current structure of the car industry, the geography and the economy "

References

Amatucci, Marcos. [2010]. Gaining competences for innovation: differences between first movers and late movers in the Brazilian automotive industry. *GERPISA The greening of the global auto industry in a period of crisis*, conference papers, Berlin, June 9 to 11, 2010, from http://www.gerpisa.org/en/acceptedproposals.

_____ y Marioto, Fábio Luiz. [2010]. Differences between innovative automakers´ strategies in Brazil. *GERPISA The greening of the global auto industry in a period of crisis*, conference papers, Berlin, June 9 to 11, 2010, from http://www.gerpisa.org/en/acceptedproposals.

Automotive News, several dates.

Consoni, Flávia y Bernardes, Roberto. [2010]. Track: Car makers strategies in the crisis. Re-organization of the R&D management of General Motors Corporation: the emergency of Brazil as a center of global product development. *GERPISA The greening of the global auto industry in a period of crisis*, conference papers, Berlin, June 9 to 11, 2010, from http://www.gerpisa.org/en/acceptedproposals.

CEPAL. [2009]. La inversión extranjera directa en América Latina y el Caribe, from http://www.eclac.cl/publicaciones/xml/9/39419/inversion2009.e.pdf

Conferencia de las Naciones Unidas sobre Comercio y Desarrollo. Inversión Extranjera Directa "UNCTAD", from http://www.unctad.org/Templates/StartPage.asp?intItemID=2527&lang=3.

_____Word Investment Report 2010 [2010a], from http://www.unctad.org/sections/dite_dir/docs/wir10_fs_mx_en.pdf,

_____Prospects for foreign direct investment and the strategies of transnational corporations [2010b], from http://www.unctad.org/en/docs/iteit20057_en.pdf.

Deloitte. [2010]. 2010 Global manufacturing competitiveness index, from http://www.deloitte.com/view/en_GX/Global/industries/manufacturing/a1a52c646d06921OVgnVCM200000bb42f00aRCDR.htm.

Dunning, John H. y Zhang, Feng. [2008]. Foreign direct investment and locational competitiveness of countries", en *Transnational Corporations*, Vol. 17, no. 3, pp. 1-29.

_____[2000], "The eclectic paradigm as an envelope for economic and business theories of MNE activity*", en International Business Review*, 9, pp. 163-190, from www.elsevier.com/locate/ibusrev.

_____[1977], Trade location of economic activity and the multinational enterprise: A search for an eclectic approach. In B. Ohlin, P. O. Hesselborn y P. M. Wijkman [eds.]: *The international allocation of economic activity*, pp. 395-418, London, Macmillan.

El Economista. México cayó en captación de IED, from http://www.eleconomista.com.mx/sistema-financiero/2010/07/22mexico-rebazado-captacion-ied-unctad.

European Commission. [2008]. Cars 21. Mid-term review. High level conference, in http://ec.europa.cu/enterprise/sectors/automotive/files/pagesbackground/competitiviness/cars21_mtr_report_en.pdf.

Freyssenet, Michel [2009], Introduction: Ten years on, what have we learnt?, in GERPISA. *The second automobile revolution*. *Trajectories of the world carmakers in the 21st. century*. Michel Freyssenet [Ed.]. Palgrave Macmillan, UK.

Instituto Nacional de Estadística y Geografía (INEGI). [2009]. La industria automotriz en México 2009. México.

Martin Granados, Ma. Antonieta [2010], Los estímulos fiscales y otros programas de apoyo a la industria automotriz en México y China. In *Estrategias globales de la industria automotriz en época de crisis*. (Unpublished))

North, Douglass C. [2001]. Instituciones, cambio institucional y desempeño económico. Fondo de cultura Económica / Economía Contemporánea, México.

Organisation Internationale des Constructeurs D´Automobiles "OICA". [2009]. 2009 Production statistics, from http://oica.net/category/production-satatistics/.

Salermo, Mario Sergio. [2010]. Economic growth, social development and crisis management: recent evolution of the auto industry in Brazil. *GERPISA The greening of the global auto industry in a period of crisis*, conference papers. Berlin, June 9 to 11, 2010, from http://www.gerpisa.org/en/acceptedproposals.

Ultra low carbon vehicles. (n.d.]. From http:www.ivestnortheastengland.co.uk/key-sectors/ultra-low-carbon-vehicles.

UNCTAD (Conferencia de las Naciones Unidas sobre Comercio y Desarrollo) (a). From [http://www.unctad.org/Templates/StartPage.asp?intItemID=2527&lang=3

_____ (b). from [http://www.unctad.org/sections/dite_dir/docs/wir10_fs_mx_en.pdf

Weber, Davide-Riccardo y Camuffo, Arnaldo. [2010]. Mapping the determinants of time-to-market in automotive new product development: a multiple case study analysis, *GERPISA The greening of the global auto industry in a period of crisis*, conference papers, Berlin, June 9 to 11, 2010, from http://www.gerpisa.org/en/acceptedproposals.

Williamson, Oliver E. [1991]. Mercados y jerarquías: su análisis y sus implicaciones antitrust. Fondo de cultura Económica / Economía Contemporánea, México.

_____ y Winter, Sidney G. compiladores. [1996]. La naturaleza de la empresa. Orígenes, evolución y desarrollo. Fondo de cultura Económica / Economía Contemporánea, México.