ASSESSING THE POWER OF PORTER'S DIAMOND MODEL IN THE AUTOMOBILE INDUSTRY IN MEXICO AFTER TEN YEARS OF NAFTA

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Abstract

It has been ten years since the signature of the NAFTA agreement among Canada, U.S., and Mexico. For Mexico, this was a decisive step away from a protectionism model toward a free trade market. One of the main purposes for Mexico in joining NAFTA was to increase the competitiveness of its manufacturing sector, especially the automotive industry.

In this paper, Porter's Diamond Model of national competitiveness and some critiques that attempt to extend the usefulness of the model are analyzed. The Doubled Diamond and the role of MNEs in a host country are both examined through a case study research of the foreign-owned automobile industry in Mexico.

The findings of this study show evidence of a broader role of MNEs than in the original framework, as well as the usefulness of the doubled diamond extension to explain alternative sources of competitiveness in early stages of development.

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The culmination of this thesis can be seen as a successful project. An analogy with Porter's Model, one of the premises to have a successful industry is to have supporting and related industries. In the case of this thesis is not the exception. There has been supporting and related people that offered me extraordinary support.

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1. Introduction

Ten years ago, the *North American Free Trade Agreement* (NAFTA) was signed among Canada, United States of America, and Mexico, with the promise of the three partners jointly accessing a huge market of 350 million people.

From the Mexican perspective, NAFTA represented the continuation of the aperture process that started with the incorporation of the *General Agreement on Tariffs and Trade* (GATT) in 1986 (Secretaria de Economia, 2004).

After years of a closed Mexican economy, in which the government restricted the presence of foreign companies or products in order to protect domestic firms, the liberalization of the trade has allowed Mexico to pursue the opportunity to access its northern neighbour markets, acquire new technologies from developed countries, support and improve the competitiveness of its indigenous industries, and attract foreign direct investment for the creation of new jobs. Many firms have prospered and numerous industries have become more successful.

But despite all these potential advantages, the opening of its borders has also meant that some Mexican companies and industries have suffered from the competitive pressure exerted by foreign firms with better capabilities such as lower cost or better differentiators that add value for the Mexican customers. So after ten years of NAFTA,

there remain unanswered questions about its impact on the overall national competitiveness of Mexico itself.

The study of national competitiveness is complex but Porter (1990) has proposed the Diamond Model to assess the sources of competitive advantages of an entire industry in a particular country. As an offshoot of this theory, his identification of the "clustering" phenomenon of cooperation and competition among related industries in a country has also been heralded as a source of international competitiveness.

In an effort to understand the competitive success of the automobile industry in Mexico, post-NAFTA, the Diamond Model has been applied to this industry, which is by most measures internationally competitive. The period of study for the industry is 1993 to 2003 providing an appraisal of "ten years after NAFTA".

The specific contributions of this study are twofold: 1) the analysis of a Mexican industry within NAFTA gives some insight into the use of the Doubled Diamond[1] (Rugman and D'Cruz, 1993) as an extension of the basic Diamond Model and 2) the use of the automobile industry in Mexico gives an opportunity to examine the critiques of the role of Multinational Enterprises in Porter's model (Clancy, O'Malley, O'Connell, and Van Egeraat; 2001; Oz, 2002, Dunning, 1993; Rugman and Verbeke, 1993).

In addition to its contribution to theory testing and extension, this study hopes to inform the applicability of the Porter's amended framework as a tool for policymakers,

[1] The Doubled Diamond refers to situations wherein some aspects of a nation's competitiveness are impacted by conditions in a major trading partner. For example, many Canadian and Mexican industries benefit from the sophisticated demand characteristics of U.S. consumers.

managers, and industry associations to strengthen the competitiveness of Mexican industries.

2. Literature Review

2.1. The Diamond Model Theory

It is important to recognize that when the Diamond Model was proposed by Porter (1990), it represented a substantially different paradigm to assess the competitiveness of a country. The previous theories, Absolute Advantage Theory (Smith, 1776) and the Comparative Advantage Theory (Ricardo, 1817) focused on each country's factors of production: land, labour cost, capital, and natural resources. According to Adam Smith, the wealth of nations was determined by the total output of production, given specific resources. As modified by Ricardo, the opportunity cost of resource deployment, not simple productivity, would determine the advantage for one country in comparison with another. In either case, however, a country was seen to be more competitive than another based fundamentally on the factors of production or endowments it enjoyed.

The problem is that when this theory found support in the eighteenth and nineteenth century, only lower skills were necessary for competition. In those days, natural resources and factors of production were the main source of competitive advantages (Porter, 1990, 13). However, as increased technological innovation and globalization of the markets have taken place, theories based primarily on factor endowments can not explain either the success of some countries that lack natural resources, or the poor performance of countries that have enormous natural endowments.

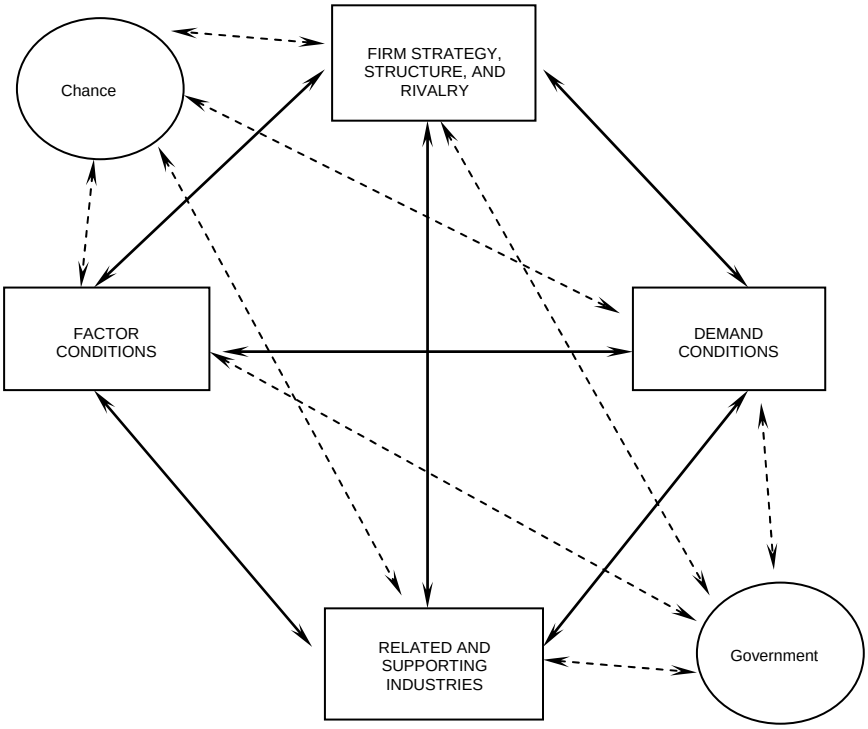
Porter (1990) argues that ***productivity*** is the main factor for international competitiveness and that the standard of living of a country's population can be improved as a direct result of increases in that factor (p.6). Productivity relies on increasing workers' skills, developing technologies, producing quality products, and reducing costs.

At the national level, productivity can be increased when the industries in a particular country "upgrade" themselves to improve efficiencies (Porter, 1990, p.6). For instance, an increase in technology can boost productivity and at the same time, can facilitate the production of differentiated products with much added value for customers. By doing so, industries can compete in more sophisticated and international markets. But in order to maintain or improve this position, an industry requires a continual upgrading process.

Porter (1990) explains that a country should focus on some industries that can be highly successful, because it is not possible to be highly competitive in every industry. To lay the theoretical underpinnings of this interplay of country and industry competitiveness issues, Porter (1990) developed The Diamond Model which consists of four national determinants of competitive advantage in a particular industry: (1) factor conditions, (2) demand conditions, (3) related and supporting industries, and (4) firm's strategy, structure and rivalry (p.71). These four sources of competitive advantage can produce a fertile soil to build an internationally competitive industry in a country. In other words, some industries, in a particular country, have strong diamonds, while others have weak ones. In addition to these four determinants of competitiveness, there are two indirect

variables in the model: (5) chance and (6) government (Porter, 1990, p.124-128). The "Diamond Model" is shown in Fig.1 following:

Figure 1: The "Diamond Model"



Source: Adapted from Porter. M.E. *The Competitive Advantage of Nations*. New York: Free Press. 1990.

The six variables of the Diamond are explained here:

Factor conditions are the factors of production and infrastructure necessary to compete in a particular industry. They include the labour skills and natural resources that in early stages of development can provide an advantage. Porter (1998) distinguishes between basic and advanced factors (p. 76-86). The first factors are

related to natural resources and endowments, abundant cheap labour, and geographic location, among others. The second ones are created by the nation such as a base of skilled workers, high tech infrastructure, research and development in institutions and universities, among others. In general, it is expected that the second ones will provide a more sustainable source of competitive advantage than the first.

Demand conditions are the pressures based on buyers' requirements about quality, price, and services in a particular industry. This will prepare the industry to compete internationally in future stages. For instance, Japanese car buyers exert pressure on Japanese car makers with regard to high quality standards forcing them to improve the quality of their products, processes, and practices, which in turn prepares the entire industry to compete internationally.

Related and supporting industries are the networks of suppliers and distributors that cooperate with the industry to support it in international competition. This is especially the case where these supporting networks already compete internationally themselves. It is difficult to compete if the industry does not have access to networks that both reduce costs through efficient supply chain management and produce raw materials and components of high quality. Vertical integration is an alternative but this is rarely feasible across an entire industry.

Firm strategy, structure and rivalry capture the robustness of domestic competition. Whether an industry is highly competitive domestically will influence the increase in

productivity needed to compete internationally. In some Latin American countries, for example, where a tolerance for monopoly practices and a closed economy exist, it is common to find the presence of very few competitors which undermines the possibility of high quality standards and efficient production.

The Role of Chance is the likelihood that external events such as war and natural disasters can affect or benefit a country or industry, but these events are entirely out of the control of the governments or managers within the industries. For instance, the heightened border security, resulting from the September 11 terrorist attacks on the US undermined import traffic volumes from Mexico, which has had a large impact on Mexican exporters.

The Role of Government, all the policies and regulations made by policymakers at all levels of government (but particularly federal) can benefit or adversely affect the competency of a country and an industry. A paternalistic government that protects indigenous firms from foreign firms is not encouraging increases in productivity or quality. Thus, when the free market does take place, these firms are not prepared for that challenge. On the other hand, a government that is working to reduce bureaucratic red tape and facilitate the process of opening a new business will encourage the entrepreneurial spirit. Similarly, government encouragement of joint ventures with foreign firms will facilitate the transfer of technology. In the Mexican case, the support of NAFTA has been a set of international policies to boost the competitiveness of Mexican industries.

Another important insight about Porter's Model is the presence of "clusters" around competitive industries. Particular industry clusters can be located in countries, regions within countries, and zones within regions. They are formed by networks established among companies, suppliers, service providers, supporting industries and associations (universities, trade associations, cooperative associations) (Porter, 1998).

These clusters of industries provide an enormous support because they build strong capabilities that later will develop competitive advantages to compete around the world (p73). In Italy, for example, leather fashion makers have the support of competitive related industries such as: leather factories, shoe designers, textile fashion cluster, athletic footwear, injection moulds, and others (Porter, 1998).The most interesting thing is that these firms compete against each other, but they also cooperate within the cluster.

Porter (1990) explains that within the cluster there are horizontal and vertical relationships. The former are between similar firms and the latter exist across the supply chain. These relationships help individual firms reduce costs through pooled purchasing and more efficient supply chain management, but also enhance innovation, sometimes through pre-competitive collaboration on product design issues. Pouder and St John (1996) and Bell (2005) find out that firms inside the cluster innovate in greater levels than the ones outside the cluster. Porter and Stern (2001) argue that related industries concentrated in geographical regions improve the innovation process.

The networks established within the cluster also increase communication (Podolny and Page, 1998; Porter, 1998). This flow of communication among firms nurtures the learning process (Powell, Koput, and Smith-Doerr, 1996) and creates knowledge (Maskell, 2001).

Finally, Porter's model (1990) argues that only internationally competitive indigenous industries can increase country productivity and country competitive advantage (p. 678). Indigenous industries are more preferable than foreign owned MNEs, as the latter usually choose the host country for reasons of either lower cost of production, access to natural resources, or access to the market, thereby only providing a temporary economic development to the host country. There is also the accompanying risk that an MNE can easily shift its location to another country that offers better cost, better natural resources or less competitive markets.

Therefore, according to the model, foreign owned MNEs play a small role in the process of economic development in the host country. As noted above, when MNEs are located in a developing country, it is not common that the strategic decisions of the MNE take place there and advanced benefits for the host country such as technology transfer to other indigenous industries are less likely. In other words, MNEs in a host country usually perform assembly activities that do not require advanced technology, skilled workers, or collaborative high tech projects with indigenous industries. Only in the early stages of development are they expected to be a source of competitive advantage (Porter, 1990, p.679) because MNEs bring some technology to the host country, employment, and some

requirements to local authorities with respect to infrastructure conditions that are useful for other industries. However if a foreign owned MNE chooses the host country to set such core decisions as R&D, production of sophisticated components or strategic decisions, then it is possible that they will transfer knowledge, technology and skills to indigenous industries. But according to Porter's arguments, a foreign owned assembly factory, established in the host country, will rarely develop skilled workers and rarely transfer know-how to other indigenous industries.

In an application of Porter (1990) to the competitiveness of Canadian industries, Porter and the Monitor Company (1991) made clear that there are three MNE motivations to invest in a foreign country: 1) Factor sourcing, 2) Market access, and 3) Host country as a base of innovation. The first one, described above, focuses on basic factors or endowments; the second, looks to avoid tariff and non-tariff barriers; and the third one, the most important, occurs only when MNEs shift the home base to the host base in order to take advantage of technological advancements, scientific progress, designing expertise, among others.

2.2. Critiques of Porter's Model

The Diamond Model has attracted some praise for its insights across levels of analysis. According to Grant (1991) Porter has built "a bridge between strategic management and international economics" because economists usually study a country as a whole with macroeconomic indicators such as: GDP, interest rate, inflation rate, while strategic management or international management scholars study firms, managers, and national

cultures. The Competitive Advantage of Nations (1990) focuses on clusters or industries as the unit of analysis, but at the end these industries are the actors that promote the country competitiveness.

At the same time, there have been some suggested adjustments to the model. In this study, two basic critiques regarding Porter's model are examined: 1) the "doubled diamond" as contrasted with the single national diamond posited by Porter (Rugman and D'Cruz, 1993) and 2) the role of Multinational Enterprises (MNEs) as empowering developing countries rather than constraining their growth (Dunning, 1993; Rugman and D'Cruz, 1993; Clancy, O'Mally, O'Conell, and Van Egeraat, 2001; O'Mally and O'Conell, 2001; Oz, 2002).

2.2.1. The Doubled Diamond vs. a Single National Diamond

In Porter's work (1990), it is suggested that to be internationally competitive, it is necessary to have a strong national diamond or strong "home base". Some scholars have argued that many small economies that have opened to international trade do not have strong national diamonds (Rugman and D'Cruz, 1993). Instead, they have at least one weak corner of the national diamond that requires reliance on the corner of a foreign diamond. For instance, Canada does not have strong *demand conditions* in its national diamond, but it has strong and sophisticated foreign demand from the US diamond (Rugman and D'Cruz, 1993). This argument suggests that in some countries the diamond model of a particular industry is linked to the diamond of another country in terms of one of the determinants (Rugman and D'Cruz, 1993). These authors go on to explain how

globalization has given rise to the phenomenon that the determinants of the competitiveness of some countries are complemented by other countries.

In Cartwright's work (1993) it is argued that some countries have 'multiple linked diamonds' such as New Zealand. In that country, the dairy industry successfully exports to more than 100 countries although their national diamond is weak or moderately weak in at least three of the determinants. Thus, the New Zealand dairy industry relies on sources of competitiveness that come from diamonds different than its own. Some developing countries also have diamonds linked to another country's diamond. The case of Mexico is discussed by Hodgetts (1993).

As a cross-over between the two proposed additions to Porter's work, Dunning, J.H. (1993) explains that MNEs activities have sometimes been decisive in regional integration among countries. In his view, MNEs have additional motives to invest in a country, different than merely having access to new markets or securing natural resources. Dunning work's (1993) suggests internationalizing Porter's framework, in which it is necessary to analyze not only the determinants of the national diamond, but also those from other countries.

2.2.2. The Role of the Multinational Enterprises (MNE's) as Empowering Developing Countries rather than Constraining their Growth

As discussed above, in Porter's work (1990), MNEs are expected to play a limited role in the development of the host country as a temporary source of competitiveness for the host

country in its early development. Porter considered the best (although rare) scenario for the host country to be when MNEs shifted their home base to the host base due to strategic reasons such as technology access, scientific advancement, expertise.

Accordingly, some studies argue that MNEs play an important role in developing countries. Rugman and Verbeke (1993) offer a broader explanation of MNEs' activities that begins by explaining that many MNEs source their strategic advantages from different countries as no one country offers all of them. In addition, their work reinforces Dunning's (1993) idea of regional integration, in which MNEs uses several diamonds to strengthen their home diamond.

In two studies by D'Cruz (1986) and Fleck and D'Cruz (1987) (cited in Rugman and Verbeke, 1993) the authors present another type of MNE configured as a 'global rationalized operation' that invests in a host country to supply part of a supply chain that exists world wide. Such companies often have vertically integrated operations located in several different countries, even though core decision making remains in the home country.

Dunning (1988) distinguished three categories of MNE operations in foreign countries: 1) resource seeking, 2) market seeking, and 3) efficiency seeking. The first two categories are similar to those proposed by Porter and Monitor (1991), but in the third one, Dunning (1988) explains that efficiency seeking is about international production where supply management is a key role. The distinction is that efficiency seeking looks exclusively for

global production integration or operational optimization, while Porter's (1990) home-base shifting to a host-base country is looking for strategic core decision making and the creation of know-how, within the new country. In other words, both positions rely on different sources of advantages. In the first one, the importance is the production efficiency, while in the second one there is a search for more sophisticated sources of advantage such as market segmentation expertise and research and development.

The efficiency-seeking stage of Dunning (1988), share some of the characteristics mentioned by Rugman and Verbeke (1993), Dunning (1993), D'Cruz (1986), and Fleck and D'Cruz (1987). Among all these points of view the variant is whether the host country produces only one part of the supply chain world wide or the entire product for the countries that belongs to the regional bloc.

Based on Dunning (1988), the research programme of the Unit on Investment and Corporate Strategies of the Division of Production, Productivity and Management of ECLAC (Economic Commission for Latin America and the Caribbean), developed a framework to analyze Transnational Corporations' (TNCs) corporate strategies to invest in Latin America (Mortimore, 2000; Economic Commission for Latin America and the Caribbean (ECLAC), 2004). In this framework, the efficiency seeking category is expanded and a category called Technological-asset-seeking is added. The expanded efficiency seeking category includes the ability to take advantage of international trade agreements to have access to export markets from the host country in which there is a balance between quality and costs on infrastructure, human resources, and local suppliers.

The added strategy takes seriously the more speculative option contemplated by Porter and Monitor Company (1991) and Rugman and Verbeke (1993) of shifting the home base to a host country.

A summary of these MNE strategies to invest in a host country is shown in table 1.

Table 1: Summary of MNEs Foreign Direct Investment (FDI) Strategies to Invest in a Host Country

MNEs FDI strategy	**Author/year**	**Main motivations**	**Core decisions**
1) Market access (market-seeking)	Dunning (1998); Porter (1990, 1991); ECLAC(2004); Rugman & Verbeke (1993)	Avoid tariff & non-tariff barriers	Home base
2) Factor sourcing (resource-seeking)	Dunning (1998); Porter (1990, 1991); ECLAC(2004); Rugman & Verbeke (1993)	Access to natural resources. Basic factors.	Home base
3a) Efficiency-seeking	Dunning (1998); ECLAC(2004)	Access to export markets. Quality & cost HR. Infrastructure. Local suppliers. Production of parts or final product	Home base
3b) Bloc/ regional integration	Dunning (1993); Rugman & Verbeke (1993)	Each country diamond strengthens the home diamond. Production of the final product.	Home/host countries in the bloc
3c) Globally rationalized operations	D'Cruz (1986), and Fleck and D'Cruz (1987) (cited in Rugman and Verbeke, 1993)	Supply part of the total supply chain. Production of a part of the final product	Home/several host countries
4) Shifted to a host country(Technological-asset-seeking)	Porter (1990, 1991); Rugman & Verbeke (1993); ECLAC(2004)	Technology & expertise, R&D,	Host base

In addition, three empirical studies found discrepancies with the original framework regard the role of MNEs. Clancy, O'Malley, O'Connell, and Van Egeraat (2001) found that the indigenous Irish software industry is supplied by predominantly foreign-owned supporting industries. This surprising considering that O'Malley and O'Gorman (2001),

presenting evidence of the international competitiveness of nations in this industry, found Ireland to be the world's second largest exporter of software products. In both studies the findings are that the presence of MNEs since 1980s has helped to nurture the indigenous industries, especially the supporting industries. In other words, the continuity in FDI in this industry has promoted the creation of a competitive cluster.

Oz (2002) conducted another empirical work, this time of the auto industry in Turkey which is dominated by foreign-owned firms. He found that the diamond model was useful to explain the relative success of this industry, but he also found that the exclusion of indigenous firms from this exclusively foreign-owned industry didn't leave space for the Turkish entrepreneurial spirit that initially launched the sector.

3. Research Setting: Why Use Mexico to Study Porter's Diamond?

Mexico is ideally suited to explore the critiques of Porter's model discussed above: First, NAFTA can reinforce the framework of doubled Diamond, as an extension of the Diamond Model. Almost 85% of Mexican exports go to the U.S. (U.S. Department of Commerce, 2004). In general, FDI (Foreign Direct Investment) of the U.S. in Mexico also shows a dependency on the US with that country accounting for 64.3% of the total FDI in Mexico in 2003 (Secretaria de Economia, 2004). This is an important point in this study. Understanding the extent of the dependent relationship that Mexico has with the U.S. can help to assess both Porter's model and the doubled diamond.

Second, the U.S. has an interest in developing the automobile industry in both Mexico and in Canada as part of the NAFTA regional economic block. In that respect, U.S. MNEs have been interested in investing in Mexico for more than 10 years. This also makes the study of the automobile industry in Mexico an excellent location to evaluate the role of Multinational Enterprises in Porter's model. In the case of the automobile industry in Mexico, there is a majority presence of foreign-owned MNEs. This industry is also probably the most successful one after 10 years of NAFTA (Vega & De la Mora, 2003, p.175). Therefore, studying this industry could provide good insights into whether or not MNEs bring technology and competitiveness to the host country. Finally, the exploration of the auto industry offers an analysis to determine MNEs' motivations to invest in Mexico.

There are also new challenges that Mexican industries must face in the second decade of NAFTA as countries like China gather their economic strength and begin to threaten Mexico's markets. Thus, through the analysis of Porter's model, as well as the two critiques discussed before, the study will also hope to provide a better understanding of this tool as a means for policymakers, managers, research institutes, and trade associations to increase industry competitiveness.

4. Research Questions

In summary, the research questions that this study will address are:

1) Does the doubled diamond better explain the competitiveness of the automobile industry in Mexico after ten years of NAFTA in comparison to Porter's single diamond?
2) Has the presence of MNEs in Mexico, in the automobile assemblers and auto parts sector, provided an increase in the national competitiveness of that industry after ten years of NAFTA?

5. Methodology

A case study of the automobile industry in Mexico has been developed. The case study method is useful when it is important to study a phenomenon in context and there are many variables to explore (Yin, 2003). The development of this industry has been within the economic and political context of Mexico as it has transitioned from a protectionist model to a free trade market.

A single case study is recommended when it is a critical case to test a theory and when it is important to do a longitudinal case, in which at least two points in time have been analyzed (Yin, 2003). The case of the automobile industry is critical due to its value to Mexico. This industry is high tech oriented, requires skilled labour and well developed supporting industries. Finally, it has a history of 50 years in Mexico. All of these factors are characteristic of a broader role for MNEs in the host country, as discussed above. A purely labour intensive industry would be closer to what Porter defines as sourcing factors or market access, while a high tech industry shows a range of possibilities from assembly activities (assuming some advanced machinery gains despite low level labour content) to more strategic, high value-added activities such as research and development. Further, the two points in time analyzed are: 1993 (pre-NAFTA) and 2003 (10 years post-NAFTA). The NAFTA agreement was intended to give rise to policies that would foster the indigenous auto parts industries and the regional integration of the entire industry among Canada, U.S., and Mexico. What evidence exists that this has, in fact, taken place?

First, to explore the diamond framework, doubled diamond extension, and the motivations of MNEs in choosing Mexico as a host country, this study has analyzed the entire auto industry in Mexico. Meanwhile, to get a finer grained understanding of the benefits of the presence of MNEs, the study has focused just on the Volkswagen (VW) automobile cluster in the Puebla State of Mexico. This cluster is important because it represents a crucial case: As one of the earliest entrants, VW has a presence of 50 years in Mexico and VW has higher levels of local purchasing compared with many other car assemblers. Thus, it was expected that if evidence of benefit from the presence of MNEs exists, then it would be found in the VW cluster.

The case study has been developed based on information from two main sources: 1) archival sources (United Nations Statistic Division- COMTRADE data base, industry reports and industry magazines, industry association information, NAFTA documents, academic journals, and government studies) and 2) interviews with managers and representatives of firms within the VW cluster in Puebla.

The archival data and interviews were used to: 1) Position the international competitiveness of the industry, 2) Identify the sources of competitiveness for the industry, Diamond Model and Doubled Diamond extension (research questions 1 and 2), and 3) Examine the role of MNEs as promoting national competitiveness (research question 2).

5.1. Positioning the International Competitiveness of the Industry

The trends of several indicators of international competitiveness were analyzed from 1993 (pre-NAFTA) to 2003 (post-NAFTA). According to Porter (1990), the indicators of the international competitiveness of an industry are: 1) Sustainable increase in exports to the world, 2) Increase in world share exports, as a proxy of market share, in a particular industry, 3) Foreign Direct Investment in that industry, 4) Trade balance in that industry, and 5) Proportion of exports in that industry with respect to the total exports of the country in a particular year (p.739-744).

The first indicator of the international competitiveness of the auto industry in Mexico was is the auto industry's contribution to the total exports of Mexico. To derive this indicator, the following approach was used: First, the top exporting industries in Mexico were listed from the maximum export value to the minimum. Then, the automobile industry was compared with all the industries that accounted for the top 50% of the total Mexican exports in both periods of time: 1993 and 2003. The purpose of this was to see how the auto industry has been evolving in terms of its contribution to the total exports of Mexico.

Some scholars have critiqued exports as a measurement of international competitiveness, but as Oz (1999) has argued, exports are the best proxy of international competitiveness that we have so far and the method of arriving at these measurements have remained consistent throughout a significant period of time (p. 42).

As a second approach to determining international competitive indicators for the automobile and auto parts industries, archival data from the COMTRADE data base of the United Nations was used. To extract the data for each industry, the Industrial Trade Classification (SITC) Revision 3 was used. This version is more current and detailed than the version SITC Revision 2 used in the analysis of the countries in *The Competitive Advantage of Nations* (1990, p743).

This Industrial Classification allows an analysis to reach into increasing detail as required: industry, sub-industry, sub-sub-industry. The majority of the analysis of export value was conducted at 3-digit SITC level with cases at the 4-digit SITC level.

5.2. Addressing the Research Questions

In order to assess both research questions, it was necessary to collect in-depth information about the automobile industry in Mexico. But for the second research question, it also was necessary to analyze the automobile cluster of VW, in particular to establish details about their development of indigenous suppliers. This information was gathered as described below:

Archival Data:

Several documents about the automobile industry were analyzed (see Appendix 1) in order to find sources of competitiveness according to: 1) Porter's Diamond Model and the Doubled diamond extension theory, 2) the presence of indigenous suppliers in the auto parts industry, and 3) MNEs' motivations to invest in the automobile industry in

Mexico. All of the documents in Appendix 1 were categorized by source into six types: Company reports, Government reports, Industry association reports, specialized magazines, Non Government Organization reports, and research reported in academic journals and books. These sources were reviewed carefully to identify possible biases, common agreements, and inconsistencies. All of the important facts were archived in a data base as a source of reference.

During the analysis of the archival data, there was general agreement on some issues and inconsistencies in others. An attempt was made to resolve inconsistencies by identifying the more authoritative source and by seeking additional sources. In general, the main problems in this regard appeared in the distinction between the development of an indigenous industry and a local industry. This point is relevant for the theory in question. An indigenous industry is generally characterized by local ownership (Mexican), whereas a local industry can have either local ownership or, as in the case of local content rules, be foreign-owned. In the case of the development of a local industry in which the majority of the capital is of foreign origin, this slippage in what constitutes 'local' represents a serious problem according to Porter's (1990) conception of MNEs as explained above. Due to its substantial policy implications, I return to the discussion of 'local' suppliers in the paper's concluding remarks.

Interviews:

Interviews were employed as supplementary source of information. They helped to fill in details about the supply chain around the Volkswagen car assembler and the development of its indigenous suppliers. The interviews were also used as a check on the accuracy of archival information given the self interest of both government and industry to portray NAFTA as a generally positive influence.

An email "invitation to participate" in a telephone interview was sent to the companies established within the Volkswagen Cluster in the State of Puebla, Mexico. (See Email in appendix 2.) The companies related to the automobile industry were selected from the list of companies that appear in the website of "The Economic Development Secretariat of the State of Puebla (SEDECO Puebla)" - section "Industrial Parks": http://www.sedeco.pue.gob.mx/infraestructura/seapi/index.htm.

A "Formal Letter" in which the research protocol is explained was provided as an attachment to the email. (See Formal letter in Appendix 3.)

An "Interview guide" was developed as a semi-structured questionnaire, according to Patton, M.Q. (2002). (See Interview guide in Appendix 4.) This guide features both general questions about the automobile industry and specific questions about the Volkswagen cluster in Puebla.

The email invitation, the formal letter, and the interview guide were written in English, then translated into Spanish, and a 3rd person then translated them back again into English to avoid translation problems. The email and the formal letter were then sent in Spanish to more than 65 companies. The interviews were conducted in Spanish, even though the option was extended to conduct them in English.

The author conducted the telephone interviews while he took written notes about the answers. Subsequently, all the interview notes were transcribed to computer files and analyzed.

The analysis of these interviews focused on: 1) the impact of the NAFTA in the auto parts industry, 2) the characteristics of the suppliers hierarchy in the auto industry, 3) the level of technological development of the company, and 4) finding evidence of the development of indigenous suppliers as a result of the presence of MNEs in the cluster VW in Puebla. In all cases, the emphasis was both on verifying information from archival sources and on surfacing new insights into the relationships between VW and its suppliers.

Some problems were encountered in identifying the appropriate email contact information for the interviews as on many company websites the Mexican operations did not have their own public relations people but were linked directly to Public Relations in a headquarters office in another country. In total, 65 emails were sent of which 15 respondents agreed to participate in the interview. However, only 6 interviews were able

to be conducted due to timing problems, with some managers being on vacation, or appointments for interviews being postponed several times. In other cases, replies were from the company's Public Relations Office indicating that they were forwarding the original email to other areas, but these areas did not respond.

One explanation of this low response is that the topic of suppliers' development may be a difficult topic to talk about, especially when the majority of Tier 1 suppliers import a great part of their requirements and the information request might easily have been seen to be biased toward indigenous suppliers. Also, it is possible that some companies did not want to reveal "strategic" information related to their supply chain. These possibilities came to mind when the researcher, upon calling some companies as a follow up, would receive what seemed to be evasive reasons to not cooperate in the study including the impossibility of sharing such information, or that a person was not the right one to answer these kinds of questions despite repeated referrals.

6. Results

6.1. The Competitiveness of the Automobile Industry in Mexico

The automobile industry in Mexico has a special importance for the competitiveness of the country. This industry relies on high technology compared with other successful sectors that primarily rely on natural resources and/or labour intensive work. The high tech nature of the auto industry helps to promote the industrialization of the country in terms of its transportation and power grid infrastructures, growth in its semi-skilled and skilled labour force, increasing productivity, and the development of other related industries such as machinery and automation.

According to Porter's (1990) arguments noted above, resource based industries do not produce high levels of value added if they only focus on a comparative advantage steaming from natural resources. Such was the case in Mexico's economy only 25 years ago.

According to Valdes (2002: p. 70), in the period 1981-83, Mexico's exports were concentrated on crude oil and gas that accounted for 72% of total exports, while manufactured exports contributed only 19% to the total. But by 1998, manufactured exports represented 90.2%, while the contribution of oil was reduced to 6.1%. The fact that the contribution of this sector had rebounded to 10.2% by 2003 only serves to underscore the point that a resource sector concentration does not help to create a stable

economy since the success of any primary extraction industry like the petroleum industry is always subject to commodity price variations.

According to ECLAC (2004), Mexico changed its export profile from a resource-based orientation to a manufacturing orientation (78.3%) in 2001. The accompanying leap of auto industry exports was from 3.9% of total exports in 1985 to 18.4% in 2001 (ECLAC, 2004).

In addition to its contributions noted above, the auto industry is also the main manufacturing employer in Mexico providing jobs for 12% of the total manufacturing work force in 2002 (Vega and De la Mora, 2003, p.175) rising to 19.8% in 2004 (Industria Nacional de Autopartes (INA), 2004).

6.2. Positioning the Industry as Internationally Competitive

Currently, Mexico is the 8th largest *producer* of cars in the world (Instituto de Investigaciones Legislativas del Senado de la Republica (IILSEN), 2003). In 2000, Mexico was the world's tenth largest automobile *exporter* (Vega and De la Mora, 2003, p.175) with a specialization in the production of small and midsize cars, light trucks, and auto parts (p.176).

Following Porter (1990), this study examined in detail the proxies for world competitiveness of the main exporter industries and sub-industries and, to appreciate the change after 10 years of NAFTA, did so at two points in time: 1993 and 2003. The

proxies examined were: Share of Total World Exports, Share of Total Mexican Exports, Balance Trade and/or Foreign Direct Investment (FDI). In Tables 2 and 3 (Top Mexican Industries in Terms of Export Value, 1993 and 2003, respectively), we can appreciate that exports of cars (SITC 7812), auto parts (SITC 784), and light trucks (SITC 7821) were in the top 10 export industries in Mexico in 1993 rising to the top 3 by 2003. These tables show the twenty two industries at the 3-digit and 4-digit level that account for almost 50% of the total Mexican exports. Table 4 provides a summary of 1993 => 2003 comparative information.

In 1993, cars, auto parts, and light trucks accounted for 13.4% of total Mexican exports, while in 2003 they represented 15.8%. In addition, these three industries increased their share of total world exports from 2.3%, 2.4%, and 1.9%, respectively in 1993 to 2.7%, 3.9%, and 9.8% in 2003.

From 1993 to 2003, cars, auto parts, and light trucks gained 0.4%, 1.5%, and 7.9% respectively in Share of Total World Exports. Even though the Petroleum industry gained 1.7% points, the export value of the auto sub-industries increased more than the resource-based industry (table 4). After the petroleum industry, cars, auto parts, and light trucks were the industries with the next highest export value of the total Mexican exports.

Table 2: Top Mexican Industries in Terms of Export Value, 1993

Code	Description	Share of Total World Exports	Export Value ($000)	Import Value ($000)	Balance Trade ($000)	Share of Total Mexican Exports	Export RANK
333	PETROLEUM OILS, CRUDE	5.8%	6,485,314	0	6,485,314	12.5%	**1**
7812	MOTOR VEHICLES-Cars	2.3%	4,242,481	393,865	3,848,616	8.2%	**2**
773	ELECTRIC DISTRIBT.EQPT	13.5%	2,779,688	1,745,784	1,033,904	5.4%	**3**
784	MOTOR VEHICLES.-Auto Parts	2.4%	2,013,789	905,054	1,108,735	3.9%	**4**
778	ELECTRIC MACH.APPART.	3.9%	2,008,824	1,931,746	77,078	3.9%	**5**
772	ELECTRIC SWITCH.RELAY.CIRCUT	3.3%	1,465,697	1,976,657	-510,960	2.8%	**6**
771	ELECTRIC POWER MACHNY.PARTS	5.3%	765,533	486,834	278,699	1.5%	**7**
893	ARTICLES OF PLASTICS	2.4%	725,146	1,837,823	-1,112,677	1.4%	**8**
776	TRANSISTORS,VALVES,ETC.	0.7%	671,103	2,249,819	-1,578,716	1.3%	**9**
7821	MOTOR VEHICLES-Light Trucks	1.9%	669,201	105,375	563,826	1.3%	**10**
775	ELECTRODOMESTIC EQUIPMET	2.3%	551,060	375,242	175,818	1.1%	**11**
898	MUSICAL INSTRUMENTS,ETC.	1.9%	448,207	503,603	-55,396	0.9%	**12**
894	BABY CARRIAGE,TOYS,GAMES	1.3%	423,358	418,830	4,528	0.8%	**13**
1123	BEER made from malt	5.9%	196,459	19,826	176,633	0.4%	**14**
895	OFFICE,STATIONERY SUPPLS	2.2%	117,500	167,472	-49,972	0.2%	**15**
899	MISC MANUFCTRD GOODS	0.7%	114,919	197,768	-82,849	0.2%	**16**
786	MOTOR VEHCLS.-TRAILERS	1.7%	110,683	106,337	4,346	0.2%	**17**
1124	SPIRITS (Liquor)	0.8%	76,578	129,928	-53,350	0.15%	**18**
897	GOLD,SILVERWARE,JEWL	0.4%	59,009	83,254	-24,245	0.11%	**19**
774	ELECTRO-MEDCL,XRAY EQUIP	0.5%	50,669	158,109	-107,440	0.10%	**20**
785	MOTOR VEHCLS-MOTORCYCLES	0.2%	36,984	134,981	-97,997	0.07%	**21**
783	MOTOR VEHCLS-Tranport of more than 10 persons	0.1%	9,942	176,897	-166,955	0.02%	**22**
	Subtotal Exports	**2.8%**	**24,022,492**			**46.3%**	
	Total Exports	**1.5%**	**51,886,416**			**100.0%**	

Source : Based on United Nations Statistics Division Data, retrieved November 30, 2004 from http://unstats.un.org/unsd/comtrade/

Table 3: Top Mexican Industries in Terms of Export Value, 2003

Code	Description	Share of Total World	Export Value ($000)	Import Value ($000)	Balance Trade ($000)	Share of Total Mexican	Export RANK
333	PETROLEUM OILS, CRUDE	7.4%	16,826,535	0	16,826,535	10.2%	**1**
7812	MOTOR VEHICLES-Cars	2.7%	12,546,164	5,749,500	6,796,664	7.6%	**2**
784	MOTOR VEHICLES.-Auto Parts	3.9%	7,009,162	9,187,190	-2,178,028	4.2%	**3**
7821	MOTOR VEHICLES-Light Trucks	9.8%	6,638,888	1,615,209	5,023,680	4.0%	**4**
778	ELECTRIC MACH.APPART.	5.7%	6,191,388	4,441,662	1,749,726	3.7%	**5**
773	ELECTR DISTRIBT.EQPT	14.0%	6,137,050	2,911,045	3,226,005	3.7%	**6**
772	ELECTRIC SWITCH.RELAY.CIRCUT	5.0%	5,181,057	7,117,814	-1,936,757	3.1%	**7**
776	TRANSISTORS,VALVES,ETC.	0.7%	2,172,209	9,808,795	-7,636,586	1.3%	**8**
771	ELECTRIC POWER MACHNY.PARTS	5.5%	1,943,390	1,686,614	256,776	1.2%	**9**
893	ARTICLES,,OF PLASTICS	2.8%	1,801,365	5,202,857	-3,401,492	1.1%	**10**
775	ELECTRODOMESTIC EQUIPMET	3.4%	1,649,344	664,358	984,986	1.0%	**11**
1123	BEER made from malt	18.2%	1,210,114	66,522	1,143,592	0.7%	**12**
783	MOTOR VEHCLS-Tranport of more than 10 persons	3.3%	677,824	94,636	583,188	0.4%	**13**
894	BABY CARRIAGE,TOYS,GAMES	1.3%	653,442	816,555	-163,114	0.4%	**14**
898	MUSICAL INSTRUMENTS,ETC.	1.6%	625,050	758,155	-133,106	0.4%	**15**
1124	SPIRITS (Liquor)	4.4%	592,532	115,224	477,308	0.4%	**16**
899	MISC MANUFCTRD GOODS	1.4%	455,238	458,125	-2,887	0.3%	**17**
897	GOLD,SILVERWARE,JEWL	1.4%	382,055	294,714	87,341	0.2%	**18**
895	OFFICE,STATIONERY SUPPLS	3.7%	329,543	362,955	-33,413	0.2%	**19**
786	MOTOR VEHCLS.-TRAILERS	2.1%	314,760	228,895	85,864	0.2%	**20**
774	ELECTRO-MEDCL,XRAY EQUIP	1.2%	249,029	314,467	-65,438	0.2%	**21**
785	MOTOR VEHCLS-MOTORCYCLES	0.3%	72,428	252,190	-179,762	0.0%	**22**
	Subtotal Exports	**4.0%**	**73,662,506**			**44.5%**	
	Total Exports	**2.3%**	**165,394,545**			**100.0%**	

Source : Based on United Nations Statistics Division Data, retrieved November 30, 2004 from http://unstats.un.org/unsd/comtrade/

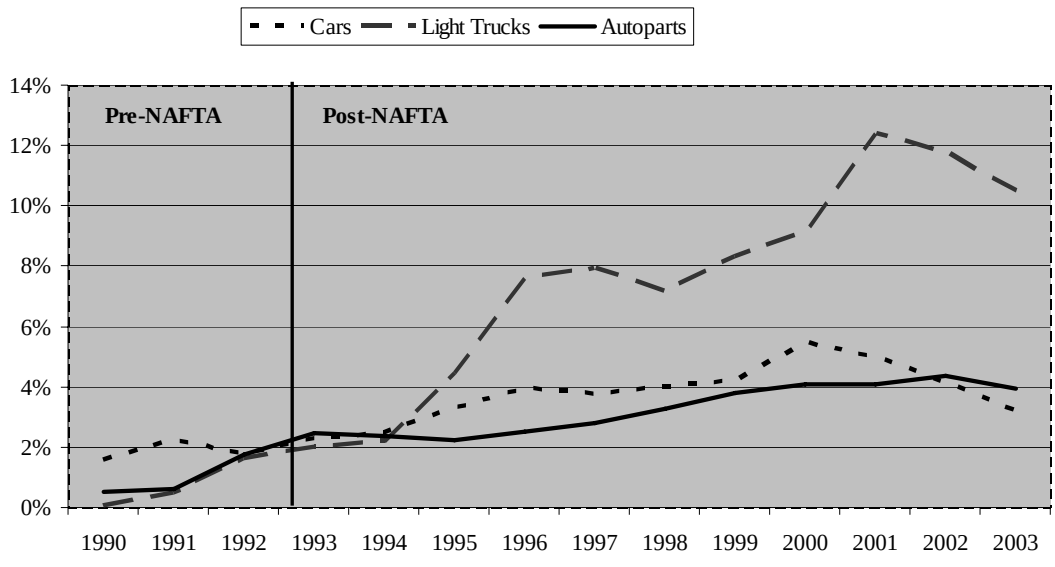
Table 4: Top Mexican Industry Exporters, 2003

Description	Rank - Export Value of Total Mexican Exports		Gain in Share of Total World Exports= ShTWE'93 - ShTWE'03	Increase in Export Value (%)= EV'03/EV'93-1x100
	1993	2003		
PETROLEUM OILS, CRUDE	1	1	1.7%	159%
MOTOR VEHICLES-Cars SITC 7812	2	2	0.4%	196%
MOTOR VEHICLES.-Auto Parts SITC 784	4	3	1.5%	248%
MOTOR VEHICLES-Light Trucks SITC 7821	10	4	7.9%	892%

Source : Author's calculations based on Table 2 and 3.

As shown in Fig.2 below, the trend of Share of Total World Exports for the three automobile sector sub-industries gives good evidence of NAFTA's benefits.

Figure 2: Mexico's Share of Total World Exports

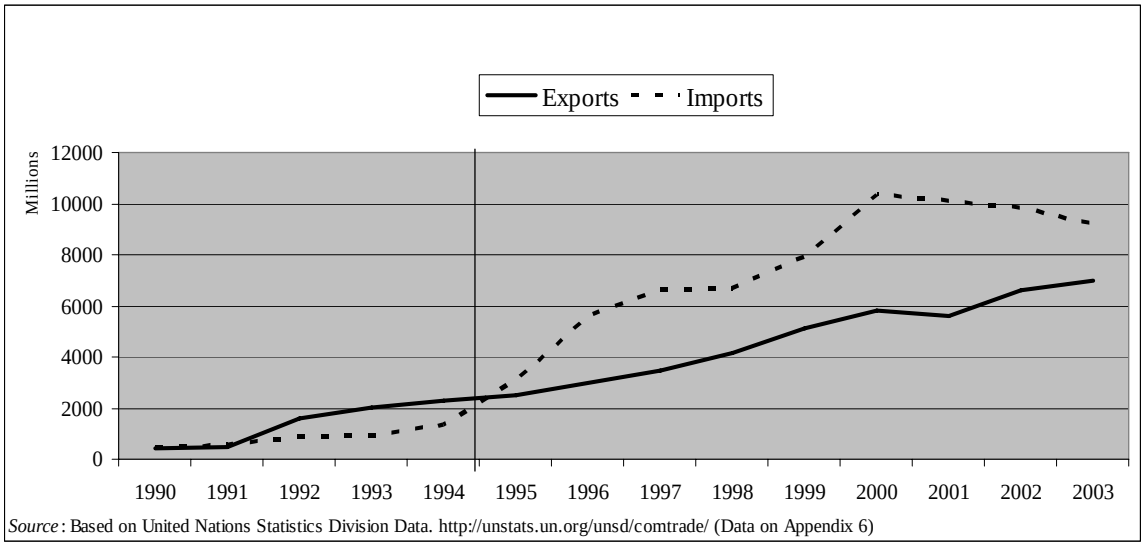


Source : Based on United Nations Statistics Division Data. http://unstats.un.org/unsd/comtrade/ (Data on Appendix 5)

It is also interesting to see that only the auto parts sub-industry changed its balance of trade from positive to negative in that period, while the cars and light trucks sub-industries have increased their positive balance of trade (Table 2 and 3). That means that Mexico is importing more auto parts and components than it is exporting them. In Fig. 3 (Auto parts Balance Trade Mexico-World) it is thus noticeable that before NAFTA (1994), the Mexican auto parts industry had a positive trade balance, but 10 years after the Free Trade Agreement this value has turned negative despite the increase of 248% in the export value of this sub-industry. In table 5, complementary information about the percentage of change of the Mexican Balance Trade of Auto parts over the years is presented. Here it can be seen that despite improvements in the balance of trade beginning in 2001, imports have exceeded exports since early in NAFTA.

This is perhaps consistent with the relocation of assembly facilities into Mexico which might previously have been located outside but also suggests a large component of foreign parts sourcing for Mexican assembly. This point will be discussed further in the section on related and supporting industries; however, due to this negative balance trade it is important that we analyze the FDI in the auto parts sector as a proxy of competitiveness.

Figure 3: Auto parts Balance Trade Mexico –World



Source: Based on United Nations Statistics Division Data. http://unstats.un.org/unsd/comtrade/ (Data on Appendix 6)

Table 5: Auto parts Balance Trade Mexico-World and Percent Change

($000 U.S. Dollars)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Exports	1,602,837	2,013,789	2,307,452	2,498,895	2,976,077	3,462,085	4,173,733	5,107,855	5,812,523	5,579,812	6,608,496	7,009,162
Imports	832,661	905,054	1,342,970	3,103,870	5,578,850	6,638,303	6,660,193	7,908,128	10,335,113	10,068,454	9,813,118	9,187,190
Balance Trade	770,176	1,108,735	964,482	-604,975	-2,602,774	-3,176,219	-2,486,460	-2,800,273	-4,522,590	-4,488,643	-3,204,622	-2,178,028
% change previous year/1	-	**44%**	**-13%**	**-163%**	**-330%**	**-22%**	**22%**	**-13%**	**-62%**	**1%**	**29%**	**32%**

/1 A positive"+" sign means that Mexico is gaining points in Trade Balance, while a negative "-" suggests a losing.
Source: Based on United Nations Statistics Division Data. http://unstats.un.org/unsd/comtrade/

Tracking FDI through a long period of time can serve as a proxy indicating that an industry is competitive. However, some countries attract FDI due to their cheap labour and/or the ability to avoid tariff barriers. In the case of Mexico, the first reason is partially true, because even though the auto industry requires skilled workers such as technicians and engineers, they can still be paid at lower levels than in developed countries. On the second point, as NAFTA will reduce to zero tariff and non-tariff barriers among the

partners to the agreement in a phase out of 10 years, it is also feasible that FDI is seeking market access.

In Table 6, it is shown that the Auto industry received $ 9.39 billion US dollars from 1999 to 2004 of which 62% was directed to the Auto parts industry.

Table 6: Foreign Direct Investment per Activity, in the Automotive Industry (1999-2004)

(millions of US dollars)

Activity	1999	2000	2001	2002	2003	2004 [1/]	Total 1999-2004 [2]	Part. %
Assembly Industry (Cars & buses)	**1,380.4**	**460.4**	**115.3**	**335.0**	**160.2**	**1,148.7**	**3,600.0**	**38.3%**
Autoparts Industry:	**802.2**	**1,147.9**	**1,287.8**	**872.2**	**810.6**	**869.4**	**5,790.1**	**61.7%**
Other autoparts & accessories	672.6	820.8	1,111.6	776.6	737.6	743.4	4,862.6	**51.8%**
Suspension Systems	-0.6	204.1	27.1	38.0	25.6	82.9	376.9	**4.0%**
Motors & parts	73.7	98.6	32.5	34.9	18.8	11.7	270.1	**2.9%**
Transmissions	37.6	2.2	8.8	10.8	17.8	24.6	101.8	**1.1%**
Brakes Systems	17.7	16.2	38.3	9.1	10.9	6.9	99.0	**1.1%**
Auto bodies	1.3	6.0	69.5	2.8	0.0	0.0	79.6	**0.8%**
Total	**2,182.6**	**1,608.3**	**1,403.1**	**1,207.2**	**970.8**	**2,018.1**	**9,390.0**	**100.00%**

1/January-December, 2004

2/ Notification on December 31, 2004.

Source: Department of Foreign Investment of the Ministry of the Economy Mexico: http://www.economia.gob.mx/

Returning to the three sub-industries, in the next three tables the international position of each of these sub-industries is shown in terms of export value compared to the world's leading exporters. In Table 7, Mexico's car exports grew 195.7% after ten years of NAFTA. Such growth exceeded the world's growth. The only country that had a more outstanding growth than Mexico was the Republic of Korea. Mexico maintained its 10th place as a car exporter.

Table 7: Top Exporters of Cars: Rank Export Value and Growth 1993-2003

Rank Export Value 1993	Rank Export Value 2003	Country	Share World Gain/Lose %	Export Growth %
2	1	Germany	0.8%	158.1%
1	2	Japan	-10.6%	44.9%
3	3	Canada	-3.5%	63.9%
6	4	France	-0.1%	144.9%
5	5	Belgium	-2.4%	71.6%
7	6	Spain	-0.3%	132.5%
4	7	USA	-3.1%	51.0%
8	8	United Kingdom	0.5%	184.4%
11	9	Rep. of Korea	1.7%	351.5%
10	**10**	**Mexico**	**0.4%**	**195.7%**
9	11	Italy	-0.7%	74.9%
			Total World:	**148%**

Source: Author's calculations based on United Nations Statistics Division Data, retrieved June 15, 2005 from http://unstats.un.org/unsd/comtrade/ (Detail on Appendix 7)

In Table 8, the outstanding performance of Mexico in exporting Light Trucks is shown with 892.1% of growth after ten years. This performance shifted its position from eleventh to fifth place while gaining a 7.6% share of Total World Exports.

Finally, in Table 9, the auto parts sub-industry shifted its place from ninth to eighth with an increase in exports of 248.1%, again exceeding the world growth. Only Spain had a greater increase of 293.1%. Also of interest, as noted above, was that despite this increase and the auto parts industry gaining a 1.5% share of World Exports, it remains necessary for the auto industry in Mexico to import a greater quantity for the car assemblers and auto parts than it exports.

Table 8: Top Exporters of Light Trucks: Rank Export Value and Growth 1993-2003

Rank Export Value 1993	Rank Export Value 2003	Country	Share World Gain/Lose %	Export Growth %
2	1	Canada	-9.7%	19.1%
3	2	USA	0.8%	123.1%
4	3	Germany	1.8%	149.5%
1	4	Japan	-17.0%	-25.1%
11	**5**	**Mexico**	**7.6%**	**892.1%**
8	6	France	2.0%	228.7%
10	7	Spain	3.1%	417.9%
6	8	Italy	0.9%	157.2%
9	9	Belgium	1.2%	193.5%
			Total World:	**106.3%**

Source: Author's calculations based on United Nations Statistics Division Data, retrieved June 15, 2005 from http://unstats.un.org/unsd/comtrade/ (Detail on Appendix 9)

Table 9: Top Exporters of Auto parts: Rank Export Value and Growth 1993-2003

Rank Export Value 1993	Rank Export Value 2003	Country	Share World Gain/Lose %	Export Growth %
1	1	USA	-8.1%	43.7%
4	2	Germany	4.9%	230.1%
2	3	Japan	-7.3%	31.8%
3	4	France	-1.8%	77.8%
5	5	Canada	-1.7%	73.8%
6	6	Italy	0.8%	153.2%
8	7	Spain	2.2%	293.1%
9	**8**	**Mexico**	**1.5%**	**248.1%**
7	9	United Kingdom	-0.5%	92.1%
			Total World:	**117.4%**

Source: Author's calculations based on United Nations Statistics Division Data, retrieved June 15, 2005 from http://unstats.un.org/unsd/comtrade/ (Detail on Appendix 9)

In the analysis of tables 7, 8, and 9 it is important to clarify that these position changes are important for Mexico, given its minimal outward FDI, but may be more ambiguous for other countries that have substantial outward FDI to other countries. For instance, Japan lost its position as the #1 exporter of light trucks (table 8), but it does not mean that its competitiveness declined. Behind these figures is the fact that Japan changed its global strategy of exporting light trucks to the U.S. to investing in the U.S. to manufacture its vehicles there.

In conclusion, Mexican performance in the three auto industry sectors outpaced world export growth placing Mexico in the top ten exporters from 1993 to 2003. According to the Mexican Secretaria de Economia (2004), only two industries in Mexico had higher annual average growth over the period 1993-2003: Electric & Electronic and Textile & Apparel. For the future, the electronics and auto industries clearly promise more value added and high tech. On the other hand, the textile and apparel industry are easily characterized as labour intensive, that despite their annual growth in the last decade, could easily see a lot of foreign-owned factories closed as operations are shifted to China.

6.3. Using Porter's Diamond to Assess Sources of Competitive Advantage in the Automobile Industry in Mexico: 1993-2003.

6.3.1. Factor Conditions

Initially, the factors that made Mexico interesting to automotive MNEs were cheap raw materials and labour, skilled workers with weaker unions than in the U.S., less stringent environmental regulations and market access to the U.S. and Latin America (IILSEN,

2003). The majority of these motivations can be reduced to basic factors, with exception of the base of skilled-workers. Mexico also has a comparative advantage in the steel industry over countries such as Brazil, Taiwan, and Korea that is reflected in the price of raw materials being from 15 to 30% cheaper (Centro de Capital Intelectual y Competitividad (CECIC), 2002). For these reasons, automotive MNEs have benefited substantially from Mexican factor conditions as the industry developed.

As Mexico entered into freer trade, market forces saw the preparation of an industrial infrastructure developed in the import substitution industrialization period that benefited the manufacturing sector (Middlebrook and Zepeda, 2003, p.20). In addition, the continuity of FDI in Mexico has allowed continuous improvement in the industrial infrastructure. The total FDI in the period 1994 to 2004 has been US$148,472 million, 49% of which went to manufacturing industries with 9% overall going to the automobile industry, i.e. $73,116 and $13, 656 millions of US dollars respectively. (Table 10)

As a result of the FDI, Mexico's labour productivity and efficiency have greatly improved. In the 80's the productivity grew 3.3% per year, and from 1990 to 2001 it grew 5.8% per year (Ramirez De la O, 2002).

Esquivel and Rodriguez-Lopez (2003) found that the gap between skilled and unskilled workers has decreased from pre-NAFTA to post-NAFTA, but that the decrease in the gap was due largely to technological progress. In other words, there has been an increase in wages in this industry post-NAFTA due to increasing technology sophistication.

Table 10: Foreign Direct Investment: Manufacture and Automobile Industry in Mexico

(millions of US dollars)

Period	Total(1)	Manufacture Industry(1)	Automotive Industry(2)	% FDI Manufacturer Industry	% FDI Total
1994	10,661.30	6,207.20	N.A.	N.A.	N.A.
1995	8,345.00	4,858.20	N.A.	N.A.	N.A.
1996	7,836.30	4,814.90	N.A.	N.A.	N.A.
1997	12,199.70	7,294.70	N.A.	N.A.	N.A.
1998	8,359.30	5,158.10	N.A.	N.A.	N.A.
Total 1994-1998	**47,401.60**	**28,333.10**	**4266.14(4)**	**15.1%**	**9%(3)**
1999	13,336.90	9,014.00	2,183	24%	16%
2000	16,909.60	9,539.90	1,608	17%	10%
2001	27,720.80	6,087.00	1,403	23%	5%
2002	15,325.20	6,525.10	1,207	19%	8%
2003	11,663.60	5,205.50	971	19%	8%
2004	16,115.10	8,411.50	2,018	24%	13%
Total 1999-2004	**101,071.20**	**44,783.00**	**9,390.05**	**21%**	**9%**
Total 1994-2004(4)	**148,472.80**	**73,116.10**	**13,656.19**	**19%**	**9%**

(1) *Source* :National Institute of Statistics, Geography and Information Mexico (INEGI): www.inegi.gob.mx
(2) *Source* :Department of Foreign Investment of the Ministry of the Economy Mexico: http://www.economia.gob.mx/ (from 1999 to 2004)

(3) *Source* : Economic Commission for Latin America and the Caribbean (ECLAC) (2000). *Foreign Investment in Latin America and the Caribbean, 1999 Report.* Santiago, Chile: Unit on Investment and Corporate Strategies, Division of Production, Productivity and Management

(4) *Source* : Author calculations

The productivity in the terminal industry (car assembly) had grown 220% by 2003, if we take 1993 as a base (INEGI, 2005). By 2003, the average salary in this industry was 29% higher than the national average due to higher levels of qualification and specialization (Secretaria de Negociaciones Comerciales Internacionales (SNCI) (2004).

The impact on wages and salaries in the auto industry in Mexico is another way to examine spill-over effects of MNE participation. In table 11, the annual average remunerations in the auto assembly, auto parts, and manufacturing industries are shown

in inflation-adjusted constant pesos. As is the case in the U.S. and Canada, average remuneration in the auto industry tends to be higher than the overall manufacturing industry average, but it is important to note that while auto assembly wages are more than twice the industry average, auto parts industry wages are only marginally greater.

This discrepancy within the auto industry reflects two things: first, the auto industry has higher levels of automation and productivity than the auto parts industry yielding greater profits to be shared with workers; second, the trend to outsourcing by the car assemblers has resulted in workers within the auto parts industry being largely unrepresented by collective bargaining. Thus there is limited evidence of substantial spill-over in terms of wage prosperity. Wages are generally high for those who work directly for the MNEs, but wages of suppliers are not significantly higher than the manufacturing industry average.

Table 11: Annual Average Remuneration in the Auto Assembly, Auto Parts, and Manufacturing Industries, in Mexico (1994-2003)

(In Constant Mexican Pesos)

Industry	**1994 /3**	**1995 /1**	**1996 /1**	**1997 /1**	**1998 /2**	**1999 /2**	**2000 /2**	**2001 /2**	**2002 /2**	**2003 /2**
Manufacture Industry	26,722	20,644	19,846	20,583	20,699	21,747	23,275	25,093	25,722	26,106
Growth %		-23%	-4%	4%	1%	5%	7%	8%	3%	1%
Automobile Industry	57,935	42,850	37,403	40,975	41,258	43,130	47,607	51,738	50,603	50,690
Growth %		-26%	-13%	10%	1%	5%	10%	9%	-2%	0%
Auto Parts Industry	27,375	21,184	21,071	21,868	21,714	23,311	25,201	27,338	27,944	26,961
Growth %	0	-23%	-1%	4%	-1%	7%	8%	8%	2%	-4%

/1 *Source* : INEGI (2002). Sistema de Cuentas Nacionales de México: Cuentas de bienes y servicios 1995-2000. Vol. I. Aguascalientes: Author.

/2 *Source* : INEGI (2005). Sistema de Cuentas Nacionales de México: Cuentas de bienes y servicios 1998-2003. Vol. I. Aguascalientes: Author.

/3 Based on Variation Percentage from: INEGI (2002). Sistema de Cuentas Nacionales de México: Cuentas de bienes y servicios 1995-2000. Vol. I. Aguascalientes: Author.

Note: Constant Mexican pesos are Current Mexican pesos adjusted for inflation, to compare the true value from different time periods. The base was 1994 and the inflation was from December of one year to December (Detail on Appendix 17).

FDI in Mexican infrastructure has also made an impact in the export structure. Before the economic opening in the '80s, the top ten Mexican export products were primary goods (petroleum and natural gas, vegetables & fruit, coffee and others), while in the '90s only two of the top ten were in this category (Middlebrook and Zepeda, 2003, p. 17).

Before NAFTA, there were environmental problems in Mexico and the regulations imposed less stringent limits than in U.S. and Canada. More recently however, there has been an improvement in regulations and economic incentives for new foreign companies to be environmentally responsible (United States-Mexico Chamber of Commerce, 1998). Some indigenous industries and MNEs have also improved environmental practices after NAFTA (Zarsky and Gallagher, 2004). In fact, in the auto industry, the car assemblers often require environmental certification, such as ISO 14000, from tier 1 suppliers.

All of the economic and political structural changes in Mexico that boosted FDI in infrastructure and especially in the auto industry will be analyzed in section “Role of Government”

Despite the importance of this industry, Mexico is still a technology follower in that it has not taken enough advantage of foreign technology (Valdes, 2002, p. 75). As the structure of ownership in the automobile industry is important in this regard, it will be discussed in following sections, in particular the majority presence of MNEs as a boost to automobile industry exports.

Another important factor condition for a superior export platform is transportation infrastructure: highways connecting the North and South American Markets and ports for the European and Asian markets. The highways in Mexico are well developed, but some of them carry the highest toll rates in the world. As argued by Prentice and Ojaj (2002 p.339), access to public free highways represents a barrier to promote a competitive trade in North America. Another related issue is the Mexican-US border bottleneck that due to the corruption of customs officials, security concerns and drug traffic, had in the past lead to the necessity to sometimes fill out more than twelve documents and two revisions (Prentice and Ojaj, 2002, p. 345).

Ports infrastructure has become more adequate and competitive, since NAFTA allowed their privatization and FDI has helped to modernize them, but there is still a need to improve land infrastructure and transportation (Prentice and Ojaj, 2002, p.337-338).

Under factor conditions, Porter (1990) also suggests advanced factors, such as research institutes that collaborate with the industry to upgrade productivity and technology. In general, the relationship between universities and industry has not been well developed in Mexico. In Table 12, it can be seen that Mexico has increased its internal expenditures in research and development from 0.22% of GDP in 1993 to 0.40 % in 2002. This is substantially lower than other countries that invested in the auto industry in Mexico such as the U.S. (2.67%), Canada (1.82%), Germany (2.51%), and Japan (3.06%) in 2002.

Table 12: Internal Expenses in Research and Development of some Countries in the Auto Industry in Mexico (% GDP)

Year	México	U.S.	Canada	Germany	Japan
1993	**0.22**	2.52	1.63	2.35	2.88
2002	**0.40**	2.67	1.82	2.51	3.06(1)
% funding from Industry					
1993	**14.3**	58.3	43.3	61.9	68.2
2002	**30.1**	64.4	40.0	65.3	73(1)

(1) 2001.

Source: Fox, V.(2004). Cuarto Informe de Gobierno [Fourth Government's Performance Report]. Presidencia de la República

On the other hand, the participation of the industry in research and development (R&D) has shifted from 14.3% to 30.1% of the GDP, in 1993 and 2002 respectively indicating that Mexico is catching up with participation rates from more industrialized countries. Porter (1990) argues that in early stages of development, the government should be involved in R&D but the main actions that produce industry competitiveness are the industry's R&D activities. As showed in Table 12, the other developed countries not only have more investment in R&D, as percentage of the GDP, but also the industry contribution to this investment ranges from 40% (Canada) to 73% (Japan). Still, progress is being made.

Another element in Factor conditions is the availability of capital to invest and create new start-ups. At the end of the first year of NAFTA 1994, the Mexican peso was devalued against the U.S. dollar. This crisis produced an inter-bank annual interest rate of 90.5%. Over subsequent years the economy recovered slowly with interest rates: 34% (1999),

18.8% (2001), 8.75% (2003), and 6.2% (2004) (Banxico, 2005). Thus, comparing these rates with Canada and U.S., this was an unfavourable situation to promote capital ventures until recent years. Again, however, the view to the future is positive.

In conclusion, there has been an evolution of factor conditions from an emphasis on basic factors to an early stage of advanced factors. There is a strong base of engineers and technicians as well as the high levels of productivity as noted above. As mentioned in an interview with a manager from Volkswagen Mexico:

> *"Mexican engineers have been trained and they are responsible for the production of the New Beetle and Bora models. These models are produced only in Mexico, which means that we received the designs from VW AG in Germany, and then we manufactured them"*

Through the flows of FDI since the NAFTA, all of the manufacturing facilities of car assemblers have been modernized to transform Mexico into a successful export platform. And even though there was an industrial infrastructure before NAFTA, subsequent FDI has further promoted its modernization.

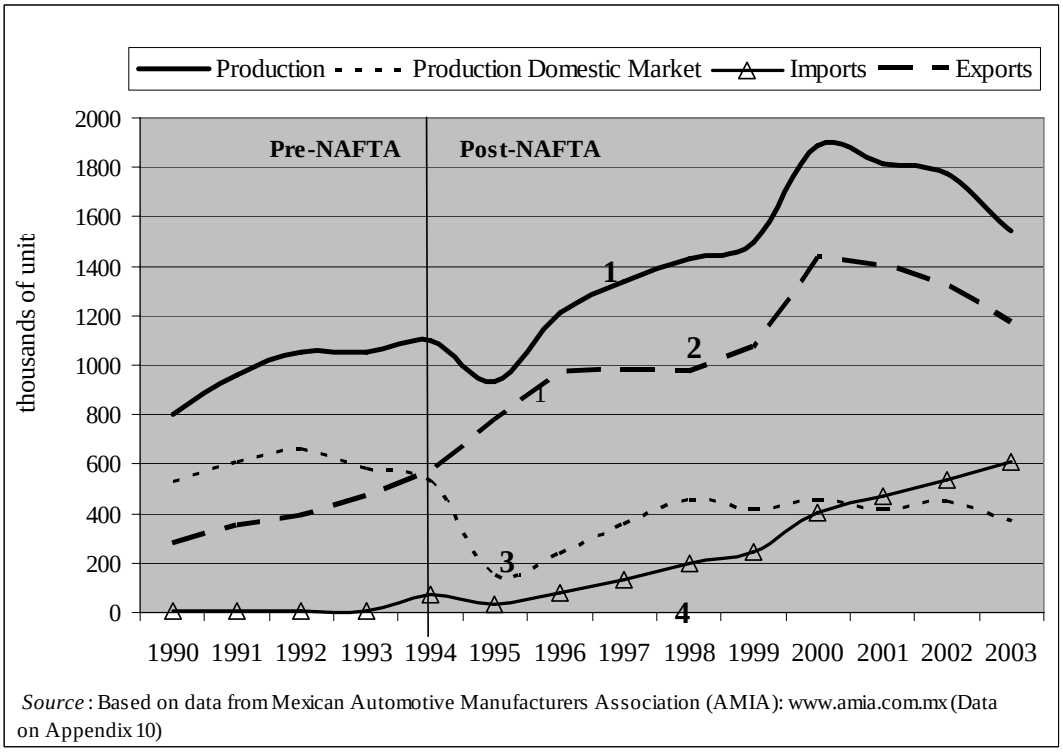
6.3.2. Demand Conditions

In order to analyze whether the indigenous Mexican market pressures car assemblers to innovate and anticipate foreign needs, or whether it is external forces such as foreign markets that pressure car assemblers in Mexico, it is necessary to examine the trends followed by the domestic and foreign market. (Figure 4)

Before NAFTA, the levels of car production were around 1,000,000 units (line 1) and more than 60% were oriented to the domestic market (line 3). After the NAFTA agreement and coincident with the economic crisis of 1994, the levels of production grew to more than 1,800,000 units. Apparently, these production levels were pulled by the foreign markets as domestic consumption was substantially reduced due to the crisis.

In addition, the openness of the Mexican market started to attract imports of cars (line 4) up to 600,000 units per year. It is important to clarify that most of these imported cars were expensive ones, which means that during the economic recovery period only the upper income levels of the population could acquire them. What is really interesting is how the production levels increased for the export markets, specifically the U.S. and Canadian markets.

Figure 4: Mexico's Vehicles Production, Domestic, Imports, & Exports 1990-2003



Source: Based on data from Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx (Data on Appendix 10)

Now, let's take a look at the segment structure of the domestic market by analyzing the sales to distributors in Table 13. The first thing that it is necessary to understand is that the total sales in 1992 were 445,303 units, while in 1995 sales dropped to 117,393. As mentioned before, Mexico lived through an important economic crisis due to the devaluation of the Mexican peso against the US dollar at the end of 1994. This event eroded the purchasing capability of the majority of the Mexicans, and caused the bankruptcy of many indigenous small and medium enterprises. Only somewhat later was a slow recovery possible and this is reflected in 1997 car sales.

Table 13: Domestic Sales to Distributors in Mexico by Class (1992, 1995, 1997, 2002, 2003)

Class	**1992(1)**		**1995(1)**		**1997(1)**		**2002(2)**		**2003(2)**	
Small	208,933	46.9%	47,786	40.7%	132,953	43.8%	426,847	59.1%	437,737	63.2%
Midsize	177,246	39.8%	52,785	45.0%	147,944	48.7%	239,271	33.1%	208,377	30.1%
Luxury	30,942	6.9%	10,437	8.9%	17,245	5.7%	46,999	6.5%	38,490	5.6%
Sport	28,182	6.3%	6,385	5.4%	5,416	1.8%	9,140	1.3%	7,962	1.1%
Total	**445,303**	**100.0%**	**117,393**	**100.0%**	**303,558**	**100.0%**	**722,257**	**100.0%**	**692,566**	**100.0%**

(1) *Source:* (INEGI) Instituto Nacional de Estadística, Geografía, e Informática (1998). *La Industria Automotriz en México*, p.91-92. Aguascalientes: Author
(2) Source : Based on INEGI (2005). *Anuarios Estadísticos Por Entidad Federativa, 2005* . Aguascalientes: Author.

Note: Includes Imported cars

As another view into this issue, we can take as a starting point the figures of 1995 to see the trend in the mix of four categories of cars: small, midsize, luxury, and sport that have been acquired by Mexican customers. In 1995, 40.7% of cars sold were small, while in 2003 that segment had grown to 63.2% of total sales. At the same period, the midsize car segment lost 15% of total sales. Drawing on the researcher's own experience of the

market, it is apparent that purchasers in the small size segment have been pressuring the automakers to produce not only cheaper cars but also those with better quality. For instance, Volkswagen de Mexico produced the Sedan VW, better known as “the people’s car” due to its accessible prices throughout the period 1965 to 2003. This model is not produced in Mexico anymore due to other automakers starting to produce cars in the same price segment, but better equipped. This has created a war to produce differentiated cars in this segment while maintaining low prices.

Meanwhile, the opening of the economy under NAFTA also opened the possibility to import cars previously not accessible, especially in the luxury and sport car segments. Since 1994, several new car brands have become available in Mexico: Mercedes-Benz (1994), BMW and Honda (1995), Porsche (1996), Audi (1997), Jaguar (1998), Peugeot & Volvo (1999), Land Rover, Renault, and Seat (2000), and Toyota (2002) (IILSEN, 2003).

The intensification of imported cars took place in 2000, due to the signature of other free trade agreements with Europe and Brazil (Rojas, 2004). With this free market, now there are 350 different models in the market (Luna, 2004). But even though 2002-2003 luxury car sales are almost 4 times greater than 1995 levels, the sports car category has been devastated and these two segments together have been hovering around 7% of the market. Still, in the US market, these two categories account for roughly 8.4%, so 7% may give good evidence of a sophisticated consumer base for Mexico given its lower per capita income levels.

Before NAFTA, the automakers established in Mexico produced old models different than the ones produced in more sophisticated markets. By 1998, the quality of the cars for export was the same as the cars for the domestic market (Ramirez De la O, 2002). Thus, it seems that the Mexican market has evolved in its level of sophistication.

Comparing the maturity of U.S. market with the Mexican market, it seems that the Mexican market is growing after the period of economic correction and recovery. As indicated in Table 14, the number of vehicles registered has grown much faster than the Mexican population in the period 1990-2003.

Table 14: Growth of Registered Vehicles and Population in Mexico

Concept	1990	1995	2000	2003	Growth%
Population	81,249,645		97,483,412		**20%**
Cars		7,759,795		13,567,649	**75%**

(2) Source : Based on INEGI (2005). *Anuarios Estadísticos Por Entidad Federativa, 2005* . Aguascalientes: Author.

This growth was mainly due to an increase in the small and midsize car segments, as mentioned previously. In fact, in Mexico City, the capital and biggest city of Mexico, there is 1 car for every 2 people (Rojas, 2004). Also as a consequence of such growth, Mexico has become the 9th market place in importance for VW Group (Volkswagen de México, S.A. de C.V. and Casa de Bolsa BBVA Bancomer, S.A. de C.V., June, 2003).

In conclusion, the 50 years of history of this industry has seen it evolve from non-sophisticated consumers to more sophisticated ones, especially in the last ten years. However, the U.S. market has also put pressure on the quality of the Mexican production since NAFTA since the majority of production in Mexico is oriented to export markets, especially to the U.S. Thus, it is the demand conditions of the U.S. market that have been a greater source of competitiveness than local demand conditions for this industry. Before NAFTA, production focused on old models with low levels of quality, while in the last several years, models have been updated and factories have been transformed with more sophisticated production processes in order to comply with the high quality requirements of the U.S. market.

6.3.3. Firm Strategy, Structure, and Rivalry

As noted before, the automobile industry in Mexico has a history of at least 50 years starting from the first Volkswagen Sedan models imported from Germany (Comunicación Corporativa VW, 2004). By 1962, the first two assembly factories were built: Ford and later VW. In Table 15, the chronological establishment of foreign-owned automakers in Mexico is illustrated.

Table 15: Car Assemblers - Establishment and Facilities in Mexico

No.	Company	Establishment	Manufacturing Facilities	Facilities Location
1	Ford	1962	Yes	Cuautitlán, State of Mexico, Chihuahua, and Hermosillo, Sonora
2	VW	1962	Yes	Puebla
3	GM	1963	Yes	Toluca, State of Mexico;Ramos Arizpe, Coahuila; & Silao, Guanajuato.
4	Nissan	1966	Yes	Aguascalientes, Ags.; Cuernavaca, Morelos
5	Daimler-Chrysler	1968	Yes	Toluca, State of Mexico; Ramos Arizpe, Coahuila; Saltillo, Coahuila
6	Mercedez-Benz	1993	Temporarily	Santiago Tianguistenco, State of Mexico (car operations 1993-1999, later only buses and Freighliner line)
7	Honda	1994	Yes	Jalisco, Guadalajara
8	BMW/1	1994	Temporarily	Toluca, State of Mexico (operations 1995-2003)
9	Porche/1	1996	-	-
10	Audi/1	1997	-	-
11	Jaguar/1	1998	-	-
12	Peugeot/1	1999	-	-
13	Volvo/1	1999	-	-
14	SEAT/1	2001	-	-
15	Renault	2001	Yes	Aguascalientes, Ags.; Cuernavaca, Morelos
16	Land Rover/1	2001	-	-
17	Mini/1	2002	-	-
18	Toyota	2004	Yes	Baja California

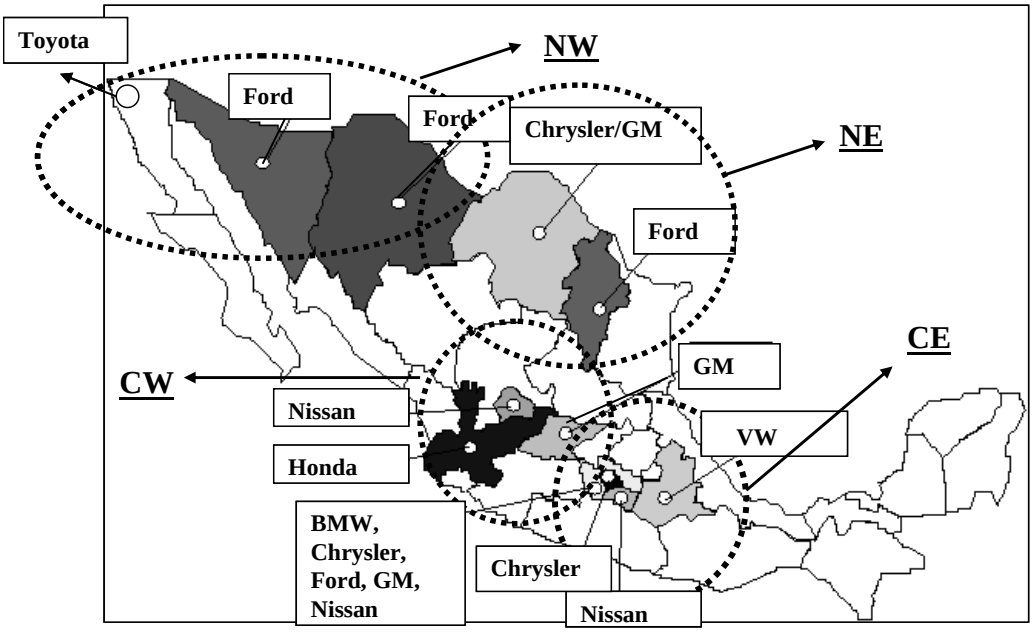
/1 Some of the Imported Cars

Source : Companie's Documents and Websites, and Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx

These eighteen automakers are the most important in Mexico, but only eight of them have manufacturing facilities. It is important to say that, in the post-NAFTA period, these car assemblers have been continually investing in adding new manufacturing facilities. In 1989 there were 13 automotive manufacturing plants in Mexico, while in 2001 there were 30 (IILSEN, 2003).

In Figure 5, the locations of the primary automobile clusters in Mexico are shown. There are 4 major clusters: North East and West, and Center East and West. The northern clusters were located with the purpose to export to the U.S. and Canada. Around these 4 clusters there has been an attraction of suppliers and related industries that have complemented the development of this industry.

Figure 5: Car Assemblers Cluster Location in Mexico



Source: Author's adaptation from the Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx

The first facilities, pre-NAFTA, were just assembly plants with low levels of automation that required low and semi-skilled labour. However, in addition to the increase in manufacturing plants, car assemblers have been modernizing and increasing their automation which has required more skilled workers. First, the North American "Big Three" (Ford, GM, and Chrysler) changed their manufacturing strategies due to the increase of competitiveness of Japanese competitors. Then, their Mexican facilities shifted from producing for the local market to exporting, with high levels of technology (Brown, 2000). They have been investing on average US$1.3 billion per year from 1994 to 2000 (Mattar, Moreno-Brid, and Peres; 2003; p.147).

The original VW facilities were traditional factories that produced old models for the domestic market until the ‘80s, but in the ‘90’s, the factories were transformed into leading edge export-oriented facilities (Pries, 1999).

Before NAFTA, the market was divided among the “Big Three”, plus VW and Nissan; but with the opening of free trade, the market share has had to be reassigned among many more competitors (Table 16).

As mentioned above, European and Asian cars have been stealing market share from the Big Three. Figure 6 shows this trend in which it is apparent that by 2004 these two regions account for almost 50% of the market while the “Big Three” have lost 15% of overall market share since their maximum peak during 1996 and 1997.

From this we might reasonably conclude that, during the last ten years, there has been intense competition and rivalry in this industry such that automakers have had to reduce prices and offer better quality even in the small and midsize segments.

The auto industry is an outstanding performance sector for Mexico in terms of export growth and world market share. However, all of the automakers are foreign-owned enterprises. Before NAFTA, there was a restriction to FDI such that foreigners could not own more than 49% of a company. This initially created a mix in origin ownership but later the government allowed an increase in foreign ownership up to 100%.

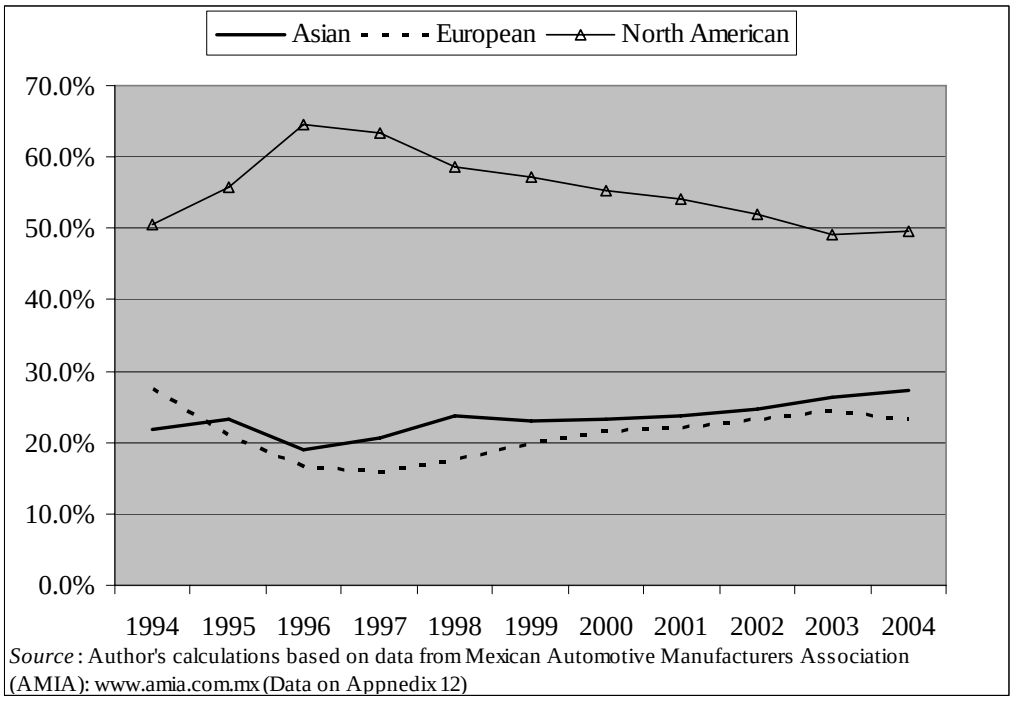
Table 16: Car Assemblers Market Share in Mexico **(In units of cars)**

Company	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
BMW	0.0%	0.1%	0.3%	0.3%	0.3%	0.4%	0.5%	0.7%	0.6%	0.5%	0.5%
Mercedez-Benz	0.1%	0.5%	0.4%	0.2%	0.2%	0.4%	0.3%	0.4%	0.4%	0.4%	0.6%
VW	27.3%	20.4%	15.8%	15.3%	17.0%	18.5%	19.8%	18.0%	16.3%	17.3%	15.6%
Audi	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.3%	0.3%	0.4%	0.3%	0.3%
Seat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	2.6%	2.3%	2.1%
Honda	0.0%	0.0%	0.6%	1.2%	1.9%	2.8%	2.9%	3.1%	3.1%	3.0%	2.7%
Toyota	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	2.2%
Nissan	21.9%	23.2%	18.3%	19.5%	21.7%	20.2%	20.3%	20.7%	21.7%	21.9%	21.4%
Renault	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	1.6%	1.9%	2.2%
Daimler-Chrysler	16.2%	16.1%	16.8%	14.0%	14.3%	13.6%	13.1%	14.2%	11.8%	10.2%	10.6%
Ford	15.2%	18.5%	20.3%	19.7%	17.2%	17.1%	16.8%	17.4%	16.4%	16.2%	16.2%
General Motors	19.3%	21.2%	27.4%	29.7%	27.2%	26.4%	25.4%	22.4%	23.6%	22.3%	22.2%
Sub-Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**99.7%**	**99.4%**	**98.9%**	**98.4%**	**97.2%**	**96.5%**
Others /1	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.6%	1.1%	1.6%	2.8%	3.5%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

/1 Others represent car companies without production of cars in Mexico (Acura, Jaguar, Land Rover, Mini, Mitsubishi, Peugeot, Porche, Smart, & Volvo). Audi and Seat are imported cars, but they are not considered in this category due to VW is the distributor in Mexico.

Source: Based on sales from Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx (Data on Appendix 11)

Figure 6: Cars Sales in Mexico - Market Share by Region Origin



Source: Author's calculations based on data from Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx (Data on Appnedix 12)

According to Porter (1990), there are three kinds of FDI motivations to enter a host country: resource-based sourcing, market access, and shifting the core decisions to the host country. In the case of the auto industry in Mexico, it was noted above that after NAFTA the original assembly plants shifted to manufacturing plants. This change speaks to dramatic increases in the level of technology employed, the sophistication of the processes involved, and the level of skills that workers should have. Even though the core decisions have largely remained in the home country headquarters of these automakers, some facilities have strategic operations for the MNE groups.

But these are not domestic operations by any means. The majority of the production goes to export markets, which means that the quality obtained in Mexico is according to international requirements. For instance, VW of Mexico produces 2,000 motors per day with the greatest quality among the other facilities of the VW group in the world (Volkswagen de México, S.A. de C.V. and Casa de Bolsa BBVA Bancomer, S.A. de C.V., 2003). Similarly, the VW plant in Puebla, Mexico is the only facility of VW AG Germany to produce the New Beetle that is exported to almost 80 countries (Comunicación Corporativa VW, 2004). Following this success, the German headquarters decided to transform the VW Mexico facility into a high tech operation (Tovar, 2000). During the period 2003 to 2005, VW invested US$2 billion to produce the models “Bora” (only in Mexico), and Jetta G5 (Volkswagen de México, S.A. de C.V. and Casa de Bolsa BBVA Bancomer, S.A. de C.V., 2003). Today these models are being produced to the highest technical and quality standards for the Canadian and U.S. markets. VW in Puebla has a new area called Design Study, within the Technical

Development Department in 2000. The purposes of this area are to improve the current models' interior and exterior design and to generate new propositions to VW group (Volkswagen de México (2005).

In conclusion, the intense competition among the many car assemblers with manufacturing facilities in Mexico, and the increase of other imported brands, generates intense rivalry within the industry as competitors attempt gain or maintain a share of the local market. But it also competition for the U.S. market that pressures the car assemblers in Mexico to produce with high levels of technology in order to upgrade the productivity standards that are necessary to satisfy the export market. This arms race to develop high levels of technology in manufacturing plants coupled with leading edge design capabilities shows that competitive rivalry is a strong source of competitiveness for the automobile industry in Mexico.

6.3.4. Related and Supporting Industries

The supply chain structure in Mexico follows the same structure of the auto industry around the world. U.S. and European automakers have attempted to copy the Japanese way of production, in which car assemblers outsource entire components to a hierarchy of suppliers (ECLAC, 2004; Gereffi, 2003, p. 212). In this integrated system, Tier 1 suppliers are the direct producers of integrated systems for car assemblers (Gereffi, 2003, p. 213). Similarly, Tier 2 suppliers produce components for Tier 1 suppliers. At the end of the supply chain there are Tier 3 firms, and in some cases Tier 4 that supply standardized products such as part metals and connectors (ECLAC, 2004).

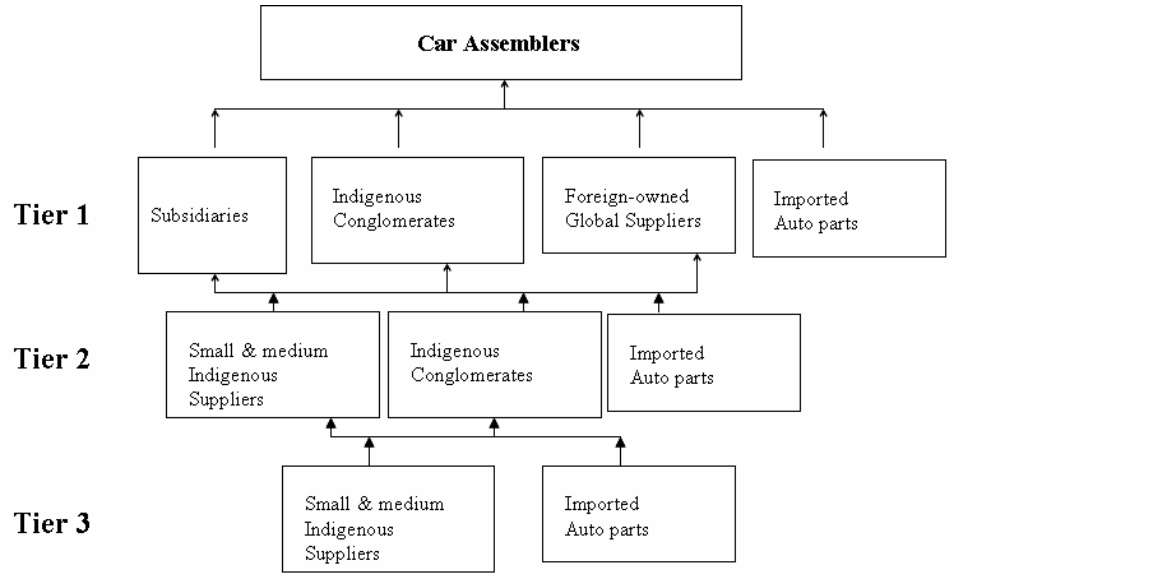
According to Bancomext (2004), in 1994 there were 600 auto suppliers in Mexico, by 2001, there were 875 registered auto parts suppliers, 60 of them tier 1 (Bancomext, 2002) (cited in ECLAC, 2004). By 2003 the number had grown to 1350 registered Auto suppliers, 281 of them being Tier 1 suppliers (Bancomext, 2004). The Industria Nacional de Autopartes (INA) (2005) reported 341 Tier 1 suppliers in 2005 (see appendices 13, 14, 15, and 16 Main Tier Suppliers by Region). Even though, there is no one source that provides the longitudinal comparison, the number of auto parts suppliers have grown in the period 1993-2003. INA (2005) also notes that the ownership structure of the auto parts industry in Mexico comprises 70% foreign-owned firms and 30% indigenous firms.

These foreign-owned auto suppliers have established themselves in Mexico as a direct result of local content conditions arising from NAFTA. The agreement sets the rules of origin, demanding that 62.5% of engines and transmissions and 50% of other parts used in automobile manufacturing in Mexico must themselves be produced in Mexico (Chambers and Smith, 2002, p.4). All the rules, government decrees, and laws will be discussed in the later section on “Role of Government”. All companies, including both American and non-American automobile companies such as VW, Mercedes-Benz, BMW, and Honda, are forced to adhere to these local content rules if they establish assembly factories in Mexico (Vega and De la Mora, 2003, p.177).

To conform to this regulation regarding local content in the Puebla cluster, the German corporate headquarters of VW promoted the establishment of German suppliers in two periods: 1970 and 1990, (Carrillo and Gonzalez Lopez, 1999). Similarly, Gonzalez Lopez

(2000), when he studied the Toluca cluster in the center of the country, also found that the supply chain is based on corporate level agreements between global vehicle assemblers and global parts suppliers. The headquarters of North American, European, and some Asian car assemblers have negotiated with their global suppliers to locate parts manufacturing facilities around their manufacturing facilities wherever they assemble vehicles, including Mexico. Figure 7 illustrates the supply chain of the auto industry in Mexico.

Figure 7: Supply Chain in the Automobile Industry in Mexico



Source: Based on Interviews of representatives of the industry

one of four types: a) Foreign-owned firms, b) Subsidiaries, c) Indigenous conglomerates, and d) Imported parts.

Tier 1 Suppliers

Foreign-owned firms are the majority category and they supply to more than one of the car assemblers. The top 10 Original Equipment Manufacturing (OEM) suppliers for

North America are: Delphi, Visteon, Lear Corp., Magna International, Johnson Controls, Dana Corp., Bosch, TRW, Denso Int'l America, ThyssenKrupp, among others (U.S. Department of Commerce, 2004). All of them have a presence in Mexico.

Carrillo and Lara's work (2003) found that the "Maquiladoras", foreign-owned assembly factories for exportation, established from 1970 to 1980, looked only for cheap labour and resources. However, since 1990 there is a new generation of facilities that have not only assembly and manufacturing functions, but also specialize in design, research, and supply chain management. For instance, Delphi Corporation has its largest Technical Center around the world in Mexico and has produced nearly 100 new inventions and patents from 1995 to 2002 (Carrillo and Lara, 2003). By 2005, the Technical Center had achieved 144 inventions including patents and U.S. defence publications (Tecnología, 2005).

Subsidiaries are wholly owned operations of the car assemblers and generally have little margin to create designs because usually the headquarters are responsible for those activities. Some of them have evolved to be independent suppliers such as Delphi Corp. from GM and Visteon from Ford. These two suppliers have increased their customer base outside their original parent.

Indigenous conglomerates constitute the smallest category. They are diversified companies with a long tradition in Mexico. In Table 17, the main Mexican conglomerates that supply the auto industry are illustrated. It is important to clarify that they are Tier 1

suppliers to some assemblers and in other cases Tier 2. In the latter case, they supply parts to other Tier 1s. All of them, with the exception of Grupo Qimmco, have at least 30 years of experience. These companies have created strategic alliances or joint-ventures with foreign-owned companies, the majority of them in the auto parts industry, in order to acquire technology, know-how, expertise, or to work in collaborative projects with the automakers and auto-parts makers. These firms have high levels of technology, productivity, and quality. All of them have acquired international quality and reliability certifications such as QS-9000, ISO, VDA 6.1, among others, in order to be able to work for the automakers.

As illustrated in Table 17, all Mexican Tier 1 suppliers have some level of research & development activities. They design components in close relationships with automakers and other auto parts manufacturers. Some of these companies are in the aluminium and steel industries. They have worked closely with the automobile industry which has allowed them to achieve higher levels of modernization (CECIC, 2002).

Imported parts from foreign firms, in other countries, are the final category. These imports have a presence in the entire supply chain. As discussed above, Mexico has a negative trade balance in this sub industry. Local auto parts firms satisfy just 23% of the local market, while the rest is covered by imports (IILSEN, 2003).

Table 17: Indigenous Tier 1 Suppliers in Mexico

Company	Establishment	Products	R&D, Design.	Strategic Alliances/ JIV
VITRO	1909	Flat glass (cars), glass containers, and glassware	Flat glass designs for auto makers	Pilkington(UK), Visteon(U.S.), Quimica M(U.S.)
Grupo Industrial Saltillo	1928	Autoparts (steel motor parts), Construccion, Household	Industrial Designs. Agreement of Technology Tranfers	Hydro Aluminium Holding Deutschland (Germany). VAW Yorkshire Foundries Limited
SANLUIS Rassini	1929	Suspension component systems, leaf springs, brake and system components	SANLUIS Rassini Technical Center in Plymouth , Michigan (2000)	Brembo S.p.A. (Italy), NHK Spring(Japan), Fabrini and Cimebra (Brazil)
Industrias de Hule Galgo, S. A. de C.V	1952	Rubber for retread tires, butyl radial inner tubes, and boots and automotive parts	Technical Training Center. Prduct design.	N/A
Grupo Carso (Condumex)	1954	Automotive Parts and Electronics, Automotive Cable, Cables, Energy, Installations	CONDUMEX Research and Development Center (CIDEC)	Leading global autoparts companies (i.e. Delphi)
Grupo Proeza(Metalsa)	1956	Automotive (chasis, suspensions), Juices & fruits, Business Development	All stages in platforms development	Ogihara Corporation (Japan), Miyasu Seisakusho(Japan), Sumitomo Corp(Japan)
Grupo DESC Automotriz	1973	Autoparts, Chemicals, Food, Real State	Six Engineering and Development Centers	Dana Corporation(U.S.), Delphi(U.S.), GKN, Hayes Lemmerz International y TRW
Grupo ALFA	1974	Auto parts, Steel, Petrochemicals, Food, & Telecommunications	Technological developments are the patented by the subsidiary Nemak. Strategic alliances to acquire technology	Ford(U.S.), Worthington(U.S.), AK Steel (U.S.), among others.
Grupo QUIMMCO	1994	Automotive components, chemicals, and construction industries	Quimmco Centro Tecnológico. Design and manufacturing of molds,	ArvinMeritor, Inc. and New Holland N.V (CNH Global, N.V.)

Source : Company's reports and websites, and interviews.

Tier 2 and 3 Suppliers

The second level of suppliers, Tier 2, is based largely on indigenous conglomerates and small and medium indigenous suppliers. However, there is a lack of integration between the Tier 1 and Tier 2 suppliers. As a result, many foreign owned Tier 1 firms import a substantial part of the raw materials they need so as to maintain their own international levels of competitiveness (CECIC, 2002). For instance, Delphi-Mexico sourced 90% of its direct materials purchasing from the U.S., even though 100% of its indirect purchasing comes from Mexico (Carrillo and Lara, 2003).

As mentioned by a manager from an important indigenous Tier 1 supplier:

> "*When our company negotiates a contract with an automaker, the negotiation takes place in Detroit, not in Mexico. If we gain the contract, Detroit will establish the quantity and all the places in Mexico where they want us to deliver the components."*

This is one of the obstacles for an indigenous supplier struggling to become Tier 1. On the other hand, a Tier 2 indigenous supplier also has problems to supply a Tier 1 firm. One Mexican purchasing manager, who works in a foreign-owned Tier 1 supplier, said:

> "*We negotiate a 5 year contract with a car assembler, in which we need to provide evidence that our suppliers have quality practices such as Statistical Control Process, QS certifications, and sometimes just-in-time practices. This situation is a serious obstacle for local suppliers."*

The Tier 3 suppliers segment is composed mainly of indigenous small and medium size suppliers of standard raw materials and imports from foreign firms located in other countries. The Tier 2 and Tier 3 suppliers usually also compete in the auto parts aftermarket in Mexico. They offer less quality but better prices than the Original Equipment Manufacturers (OEM) (IILSEN, 2003).

In conclusion, after analyzing the supply chain in the auto industry in Mexico, it seems that there is a strong structure of Tier 1 suppliers of which the majority are global suppliers. There is also evidence of a few indigenous Tier 1 suppliers that have a long history in Mexico, and after ten years of NAFTA, they have arranged collaborative

agreements with global companies. In doing so, they have acquired high-tech capital equipment and expertise. The next levels of suppliers, Tier 2 and Tier 3, seem to be not well integrated into the supply chain, but there is evidence of the creation of new small and medium size enterprises (SMEs) that produce related products for the export markets (Secretaria de Negociaciones Comerciales Internacionales (SNCI), 2004).

6.3.5. The Role of Government

As we have examined the automobile parts and assembly industries, in the above discussion, it has been clear that government rules, policies, and free trade agreements have contributed in large part to the current situation. Law changes in FDI, property rights, and privatization have all increased foreign investment in Mexico (Valdes, 2002, p.69). There have been four distinct regulatory periods for the automotive industry in Mexico that have been characterized as: Vehicle imports, Model of Import Substitution, Development of national auto parts firms, and Free Trade (CECIC, 2002).

In the first stage, Mexico satisfied its domestic needs through very simple vehicle assembly facilities and importing cars from U.S. Car prices were controlled by the government and the local content of the auto industry was less than 20%. But the government wanted to develop indigenous industries, so Mexico then started adopting an Import Substitution Model. This model was applied to the auto industry by government decrees in 1962, 1972, and 1977 with the intent to develop an auto parts industry (Brown, 2000). At that time, FDI in a particular project was limited to 49%. Limited also was the number of car assemblers and brands offered. Before 1994, only Ford, VW, Nissan, and

Chrysler had operations in Mexico. This limitation should have allowed indigenous suppliers to grow and feed the industry. Local content was required to be 60% for cars.

By the late 70's, Mexico had a trade deficit and problems acquiring capital goods. The cars produced in Mexico were old models with poor quality. Then, further government decrees were released in 1977 and 1987, in order to promote export activity (Brown, 2000). At this stage the hope was to maintain the growth of local suppliers, but local content was reduced to 36% for those companies to focus on developing their export markets. Foreign ownership was allowed in auto parts firms, but only if they exported.

Finally, the fourth stage started with the incorporation of Mexico into the GATT (now the WTO), and later saw the NAFTA agreement in which the auto industry was oriented to the free market. In this period, the percentages of local content were reviewed, imports of brand new cars were permitted and the market was opened to new car assemblers (Brown, 2000). Under NAFTA, all cars produced in North America were to have a specific regional content. The percentages were fixed according to different periods of time: 50% (1995-1997), 56% (1998-2000), and 62.5% (since 2001) (Bancomext, 2004). This local content had to be maintained if car assemblers wanted to receive 0% on tariffs when exporting to the other regions of NAFTA after the 10 years phase out period. This period of ten years started in 1994 with the purpose being to reduce duty tax when exporting within the NAFTA region. This means that Mexicans can now import brand new cars from the U.S. and Canada without duty tariffs. This is a challenge for the auto

industry in Mexico because car assemblers should have high standards of productivity and at the same time high levels of technology.

Mexico has signed several free trade agreements as noted in Table 18. All of them require a percentage of local content in the segment of cars assembled within the region in question. The intent is to continue promoting the auto parts industry in Mexico. Unfortunately for the development of indigenous firms, a 100% foreign-owned Tier 1 supplier (or maquiladora) established in Mexico is considered by NAFTA as "local". Thus by doing little more than employing local labour, the auto supply chain can satisfy the rule of origin (local content).

In addition to the phase out reduction on tariffs on auto parts imports to almost 0%, the Tier 1 suppliers import nearly all their raw materials, leaving only space for the very best Tier 2 Mexican companies such as the indigenous conglomerates discussed above.

Table 18: Mexican's Free Trade Agreements with other Nations

Free Trade Agreement	Countries	Started
NAFTA	U.S. and Canada	Jan. 1, 1994
G3	Colombia and Venezuela	Jan. 1, 1995
México - Costa Rica	Costa Rica	Jan. 1, 1995
México - Bolivia	Bolivia	Jan. 1, 1995
México - Nicaragua	Nicaragua	July 1, 1998
México - Chile	Chile	Aug. 1, 1999
EU	European Union	July 1, 2000
México - Israel	Israel	July 1, 2000
México - TN (Triáangulo del Norte [North Triangle])	The Salvador, Guatemala, and Honduras	March 15, 2001
México - EFTA (European Free Trade Association)	The Republic of Iceland, the Principality of Liechtenstein, the Kingdom of Norway and the Swiss Confederation	July 1, 2001
México - Uruguay	Uruguay	July 15, 2004
México - Japón	Japan	Apr. 1, 2005

Source : The Ministry of the Economy Mexico: http://www.economia.gob.mx/

One of the managers interviewed from VW explained what it means to be a local supplier:

> "*A local supplier is someone that has met the requirements of the group and preferably is installed near our facilities to deliver just-in-time. It doesn't matter if its original capital is Mexican, North American, European, or Asian. For us it is a Mexican supplier."*

Finally, despite the fact that NAFTA has continued the trend in Mexico to an openness of trade since its entry into GATT in 1986, there is still a need to improve the internal regulatory framework for businesses (Valdes, 2002, p.79). The influence of government is important not only to continue to increase the auto industry's productivity, but also to change some business taxes, customs, and labour regulations to remain competitive (Ramirez De la O, 2002).

6.4. Assessment of the Diamond Model Framework

A summary table containing the assessment of each of the determinants of the Diamond Model Framework is shown in Table 19. This table makes reference both to the Mexican diamond itself and to support from the U.S. diamond to the Mexican diamond. Each of the sources of competitive advantage is rated at three possible levels: High (H), Medium (M), and Low (L) or, in some cases, at a transition stage (i.e. L-M from Low to Medium). These assessments are according to the author's judgement based on the analysis in the previous sections.

In conclusion, the Mexican diamond for the auto industry could be characterized as moderately competitive across most of the Diamond's determinants with its relative success on the global stage attributable to substantial support from the U.S. diamond (particularly with respect to Demand) and the diamonds of other countries with global competitors in this industry. In other words, despite that Mexico has won share of total world exports in small and midsize cars, light trucks, and auto parts, there is evidence that the determinants of the national Diamond are not the main source of these competitiveness.

However, as in other small nations with open economies, the double diamond framework is a useful extension of the original model to understand alternative sources.

The Diamond Model has been a useful tool to understand to some extent the areas that provide support to this industry and the weak points that should be reinforced in the automobile industry in Mexico, but the analysis also showed that there are additional sources of competitiveness that came from the U.S. Diamond especially.

The Mexican Automobile Diamond has been supported for FDI in three of the determinants: factor conditions, firm strategy, and related industries. As Dunning (1993) stated, MNEs are the protagonist actors of the regionalization process. In a U.S. Automotive report (U.S. Department of Commerce, 2004) it was argued that even without NAFTA, this industry would be regionalized among the three countries.

Table 19: Assessment of the Mexican Diamond and Doubled Diamond (U.S.)

Country Diamond	Concept	Factor Conditions	Demand Conditions	Firm Strategy, Structure, and Rivalry	Related and Supporting Industries	The Role of Government
Mexico	**Assessment**	**M**	**M**	**H**	**L-M**	**M**
	Sources of Competitiveness	Basic industrial infrastructure. Skilled workers. Productivity. Low cost raw materials and labour. Market access.	Evolution from low to medium – high sophistication. Growth of vehicle park.	Strong competition among many global firms since 1994.	Small base of indigenous Tier 1 suppliers. Aluminium and Steel Industry. JVs between indigenous firms and foreign-owned suppliers.	NAFTA and other free trade agreements. FDI law. Local content favours employment over technology transfer
U.S. support	**Assessment**	**H**	**H**	**H**	**H**	**M**
	Sources of Competitiveness	U.S. MNEs automakers FDI in Mexico. Car assemblers Technology	High sophistication of foreign buyers	Externalized by U.S. demand conditions and FDI in Mexico	U.S. MNEs global suppliers FDI in Mexico	The signature of NAFTA

In the case of the automobile industry in Mexico, the regionalization of the North American economic bloc (Canada, U.S., and Mexico) allocates different sources of competitiveness in each of these countries.

6.5. The Role of the MNE: the VW Cluster in Puebla

Carrillo and Lara (2003) argue that the presence of MNE auto manufacturers in Mexico such as VW, Ford, Nissan, and GM has produced significant regional developments in terms of workers' learning and new start-ups, both local and foreign owned. However it appears to be a fact that most car automakers were originally established in Mexico for other reasons, usually to have access to the Mexican market before the NAFTA, and later to have access to the U.S. market, while simultaneously gaining access to basic factors such as resources and cheap labour. As discussed earlier, Porter's position on the contribution of MNEs to national competitiveness emphasizes the latter while treating the former as a relatively insignificant spill-over effect. The object of the second research question in this study is to determine the extent to which Carrillo and Lara's argument is sound.

We undertake this task by focussing on the Volkswagen cluster in the state of Puebla that has been established since 1962. First, some descriptive facts: This cluster agglomerates an important grouping of suppliers and related industries; however, it is itself part of one of the four larger clusters, Center East, mentioned earlier. Within the Central East area of Mexico are the states of Hidalgo, Mexico City, Morelos, Puebla, and Tlaxcala, the total area from which VW sources auto parts from nearly 300 suppliers.

As discussed above, VW Puebla has historically had the greatest levels of local (indigenous and foreign-owned firms) purchasing, for example, 41.5% in 1999 compared with Ford and GM at 27% and 29.6% respectively (Juárez, 2001). Thus, if MNEs play a

significant role in sustainable national competitiveness, we expect to find it here where there are more indigenous suppliers than in other clusters. We also hope to reach some conclusions about ***why*** VW has reached this level of indigenous supply chain contribution given the clear policy implications.

By 2000, VW had benefited its 285 local suppliers by acquiring 60% of its inputs from them and had helped 200 of them to get certified (ISO 9000 and VDA 6.1) through its Institute of Training and Development (Comunicación Corporativa VW, 2001). Sixty suppliers out of 285 are located within Puebla Cluster with 27 immediately beside the VW facilities to support just-in-time delivery (Comunicación Corporativa VW, 2004).

However, while its use of indigenous suppliers is better than most, the fuzziness of the local vs. indigenous distinction discussed above remains evident when VW's major suppliers are examined. In Table 20, some of the most important Tier 1 suppliers of VW in Puebla are shown. The majority of them have German origin. This is not surprising, since in the '90's The German Big Three (VW, BMW, Mercedes-Benz) started a process of globalization in which it was deemed critical that Tier 1 suppliers should have production factories close to the car assembler's plant (Pries, 1999).

Since these suppliers at the time were German firms and local content rules did not recognize country of ownership, it was natural that the existing suppliers would simply relocate their manufacturing facilities to Puebla.

Table 20: Tier 1 Auto parts Suppliers in Puebla, Mexico

Company	**Origin**
AUTOTEK/MAGNA INTERNATIONAL	Canada
PLASTIC OMNIUM	France
FAURECIA DUROPLAST	France
BENTELER de MEXICO S.A. de C.V.	Germany
BROSE Inc.	Germany
FTE MEXICANA	Germany
HP PELZER AUTOMOTIVE SYSTEMS	Germany
TEXTRON	Germany
KIEKERT DE MEXICO	Germany
LAGERMEX	Germany
LUK	Germany
PARKER HANNIFIN	Germany
SIEMENS	Germany
ThyssenKrupp Metalúrgica de Mexico S.A. de C.V.	Germany
THYSSENKRUPP PRESTA	Germany
VITRO: AUTOCRISTALES DE ORIENTE	**Mexico**
SANLUIS Rassini	**Mexico**
SKF	Swiss
FEDERAL MOGUL	U.S.
TENNECO	U.S.
TRW Sistemas de Direcciones, SA de CV	U.S.
JOHNSON CONTROLS	U.S.

Source : Based on interviews in the Volskwagen cluster, in Puebla

It is possible, however, to see the wholesale relocation of German suppliers as a necessary bridge toward a larger role for indigenous firms since local firms were not in a position at that time to take up this work. These German suppliers need to source other raw materials from tier 2 suppliers that presumably can be indigenous firms leading to a gradual upgrading of local competencies. For example, the industrial park, Finsa, that contains the VW cluster, is composed mainly of auto part firms wherein there are two meetings a year in which every firm discusses common interest issues. In addition, the

cluster promotes the development of human capital resources (Pries, 2000) which has led to an abundant source of Mexican engineers and technicians available within the cluster.

According to an executive of VW, the manufacturing facilities to produce the New Beetle and Bora models have high standards of productivity and technology. As mentioned before, these models are only produced in Mexico, and with the Jetta G5 model are exported to foreign markets, especially to U.S. and Canada. The designs of the first two models were made in Germany, but all the manufacturing plants of the group have to compete for the exclusivity of production. The decision to produce the New Beetle only in Puebla was made based on: geographic position, the industrial park in the region, and the established global suppliers there (Tovar, 2000).

As a further trickle-down benefit, the fact that VW's presence in Mexico has allowed the development of a cluster of world class suppliers was also a major factor in Puebla's ability to attract BMW and Mercedes-Benz Mexico, because neither assembler has enough volume to attract global suppliers on their own (Carrillo and Gonzalez Lopez, 1999).

VW of Mexico also has a training institute to provide several kinds of managerial, technical, and quality expertise for the organization itself and to current or potential suppliers. VW, joint with some government programs, is helping to upgrade the knowledge and skills of 200 small and medium size indigenous companies that provide services and complemented materials. Some of these programs are: COMPITE, CRECE,

and NAFIN (Comunicación Corporativa VW, 2001), however, as expressed by an executive of VW:

> *"The main problem for these small and medium size companies is to receive the appropriate funding from banking institutions. Sometimes the sourcing is not enough, and the period is too short"*

This cluster also faces the problems of the lack of integration between Tier 1 and Tier 2 suppliers described above. Only Tier 1 firms are integrated to VW, working in close collaboration. Despite the efforts of VW to integrate Tier 2 and 3 suppliers, there is not a strong base of certified suppliers in QS-9000, ISO 9000, and VDA 6.1. For VW Mexico, the work that has been done to help these 200 suppliers to be certified in quality standards has been successful. However, the majority of them are MNEs or joint ventures with Mexican firms.

But success stories do exist. A manager from a supply company of VW mentioned two successful cases of indigenous Tier 2 suppliers that replaced imports from U.S. companies of steel and sand. Both were certified and have been continuing to supply the quantities specified.

In conclusion, the presence of VW in Mexico as a MNE has contributed to continually upgrading investment in knowledge and skills in the region. It has a successful integration with Tier 1 suppliers and has helped to attract other primary car assemblers to

Mexico. However, there is not enough evidence that Tier 2 and Tier 3 suppliers have become part of the supply chain.

These results are similar to other clusters in the country, for instance the cluster around Nissan manufacturing facilities is based on fully integrated Tier 1 Japanese companies with indigenous suppliers provide only indirect materials and services such as transportation of personnel, security, and offices supplies (according to the government representative of the cluster in Aguascalientes, Mexico). In the case of the northern clusters, there is evidence of some producers of steel mechanical pieces that have evolved and now are suppliers of Tier 1 firms. But again these are isolated cases.

In general, Foreign Direct Investment in the automobile industry in Mexico has evolved in terms of MNEs motivations and corporate strategies, which is an evidence of a broader role of MNEs when investing in a host country (table 21).

Before the NAFTA, the main motivation was to have access to the protected Mexican market (strategy #1). Later in the early days of the NAFTA, the agreement provided an opportunity to take advantage of basic factors such as low cost raw material and semi-skilled workers (strategy #2) while also gaining duty free access to broader NAFTA markets. After ten years of NAFTA, the MNEs have continually investing in the industry with the purpose to transform the original infrastructure, into an export platform. This strategy has created a more advanced infrastructure that requires more technical skills from Mexican engineers and technicians (strategy #3a) ECLAC (2004). In parallel to this

strategy, the U.S. automobile industry has taken advantage of NAFTA's regionalization impact, in which both Canada and Mexico play important roles as car producers and auto parts producers (strategy #3b). In this way, the Mexican diamond has been complemented by the U.S. diamond due to regionalization as explained by Dunning (1993).

In 2002, U.S. imports of automotive parts from Canada and Mexico accounted for 53% of the total (U.S. Department of Commerce, 2004) providing some evidence of the regionalization of the auto industry. As Rugman and Verbeke (2004) have argued, the majority of MNEs follow regional strategies, rather than global strategies, citing the fact that 80.3% of the total sales of 320 firms they studied were done in the home region of their triad (NAFTA, EU, or Asia).

Table 21: MNEs Foreign Direct Investment Strategies: the Auto industry in Mexico

MNEs FDI strategy	**Explained the case of the Auto industry in Mexico**	**Main points**
1) Market access (market-seeking)	Partially	Mexican market is growing
2) Factor sourcing (resource-seeking)	Partially	There is a basic infrastructure, cheap labour, skilled workers
3a) Efficiency-seeking	Definitively	Export platform, medium infrastructure, base of engineers & technicians
3b) Bloc/ regional integration	Definitively	U.S., Canada, & Mexico are integrated in this industry
3c) Globally rationalized operations	Partially – Auto parts	Some auto-parts components are produced in Mexico for the Global supply chain
4) Shifted to a host country(Technological-asset-seeking)	Not yet	Isolated R&D steps

Despite the fact that Mexico has a deficit trade balance in auto parts, some global suppliers and indigenous suppliers have produced auto parts for the whole supply chain within the NAFTA region (strategy 3b and 3c). That is the case for Delphi Corporation where fully 20% of its manufacturing facilities are located in Mexico allowing them to export some components to GM's and other North American car assembler's operations in the U.S. and Canada.

Finally, there is isolated evidence that some MNEs have started to do early stage R&D in Mexico, even though the majority of the core decisions are still made in headquarters. Thus, although the beginnings are in place, it would be premature to say that MNEs, both automakers and auto parts suppliers, are in Mexico due to the presence of state of the art knowledge and practices in automobile technology. On the other hand, this presence of MNEs has not fostered a massive development of indigenous suppliers. As noted by a manager of a foreign-owned firm:

> *"Mexico has an enormous opportunity to develop tier 2 and 3 suppliers, because tier 1 suppliers would prefer to have a local sourcing rather than importing from other countries. However, the challenges are to guarantee the quantity, quality, and prices required by the supply chain".*

7. Conclusion and Discussion

After analyzing the auto industry in Mexico and the Volkswagen cluster in Puebla, we can establish some important conclusions about the industry and about the theory of international competitiveness presented by Porter and other scholars.

It is important to make an initial comment about some inconsistencies that were found when analyzing the documents for this study. Not surprisingly, the Mexican Government reports were more optimistic about the competitiveness of the industry than the work conducted by researchers, company interviews and reports, and third party institutions such as NGOs.

The main differences appeared when analyzing the possible development of indigenous suppliers as a result of the presence of MNEs during the ten years covered by the study. A general agreement was that there is some development of local suppliers, but the majority of them are foreign-owned companies. Even the small numbers of indigenous conglomerates that are successful have strategic alliances with these other MNEs. There are only a few cases of small and medium size businesses that have been developed.

The main findings of this study have several implications for scholars. As applied above, Porter's Diamond Model is a powerful tool to identify the sources of international competitiveness for an industry. However, for developing countries that have recently entered the free market, the model needs some adjustments. In the case of Mexico, and especially for its automobile industry, the extension called the "Doubled Diamond"

(Rugman and D'Cruz, 1993) and the idea of regionalization by Dunning (1993) helps in explaining alternative sources of competitiveness. In this respect, the study supports other empirical studies finding similar conclusions in other jurisdictions (Cartwright, 1993; Oz, 2000; Clancy *et al*., 2001).

While there is no doubt that it is preferable for a country to either develop its indigenous industries or attract MNEs that are willing to shift their home base due to the advance sources developed in the host country, in the case of recent industrialized countries, such as Mexico, MNEs can be proactive in creating a more advanced infrastructure in the host country. The automobile industry in Mexico provides evidence that there are intermediate steps to the final point proposed by Porter, in which MNEs looks for export platforms with a medium advanced infrastructure. This intermediate point is preferable to only providing market access or sourcing factors to MNEs of foreign countries.

Porter (1990) also specified that these MNEs can be the starting point to create a cluster where indigenous industries can grow and learn (p.679). Based on this study's findings, the presence of the MNE VW has been the main protagonist for substantial growth and development within the Puebla industrial cluster. While information regarding other clusters is more anecdotal, it would appear that the main four automobile clusters in the country are also being positively impacted by the presence of MNEs in Mexico. Within these clusters Mexican conglomerates have increased their expertise, technology, and export value. However, there is only limited evidence of technology transfer from MNEs to indigenous small and medium size firms inside the VW and other clusters.

The implications for practitioners in the industry and government policymakers are several. There is no doubt that the automobile sector in Mexico is internationally competitive and even though the car assemblers are 100% foreign-owned, their motivations to establish in the country appear to be progressing beyond merely having access to the market and securing some basic factors to reduce costs. In this sense, the auto industry in Mexico is offering several sources of advantage to its host: a semi-advanced industrial infrastructure, an abundant base of skilled workers, several free trade agreements that position the country as an export platform, and a balance of adequate technology and low costs. This stage of development is evidence of the significant level of international competitiveness that Mexico has achieved in this industry. Last year, Toyota established its first facility in Mexico and it promises to continue investing, as are the other car assemblers, in upgrading its technology and production capability.

However, these sources of advantage can be emulated by other nations. For instance, China is moving from just assembling products with low labour costs to more sophisticated manufacturing while maintaining its low costs. Thus, Mexico must make progress in three main areas: First, the regulatory framework that is an obstacle for the development of a competitive industry needs work in order to attract and maintain FDI. Second, policymakers should work with industry to increase and improve programs of supplier development within the auto industry such as that described at VW above. There are enormous opportunities for Tier 2 and 3 suppliers to integrate within the supply chain. And third, it is important for the country to work on a long term plan to establish collaborative projects of research and development between universities and industries.

The government should also provide financial incentives to invest in R&D for firms and universities in order to transform the Mexican export platform into a more innovative industry.

There are some limitations in this research that must be addressed. A single case study cannot be generalized to other industries or to other countries. But other case studies conducted to test the Diamond Model Theory have arrived at similar findings about the necessity of an extension model (doubled diamond / multiple diamonds) and the need to amplify the role of MNEs in host countries. These corroborations provide some comfort regarding the generalizability of this study's findings. Also, in contrast to the broad survey of industries more characteristic of studies of national competitiveness, this study has provided deeper insight into the dynamics of competitiveness in a single industry. finally, this case was unique due to the high technology nature of its focal industry, an important issue in Porter's work (1990). The study was also conducted longitudinally providing insights across a ten year period in contrast to usual cross-sectional analyses.

Future research can be focused on determining if the efficiency-seeking stage will lead to what Porter called shifting home base to a host base or, in keeping with the truly nation-less global corporation, multiple host bases. Also, it would be useful to develop more fully the next steps that policy makers should take to promote the development of Tier 2 and 3 suppliers because it seems that after ten years of NAFTA, there are still only a few, isolated cases of success. Mexico needs more.

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9. Appendices

Appendix 1: List of Documents for Qualitative Analysis

Type	Author/year	Document
C	Comunicación Corporativa VW (February, 2001)	Volkswagen de México Promueve el Desarrollo de Proveedores en México. [VW Mexico promotes the development of suppliers in Mexico].*Boletin*
C	Comunicación Corporativa VW (March, 2004)	Volkswagen, 50 años de presencia en México. [VW, 50 years of presence in Mexico]. *Boletin*
C	ITESM Noticias (2005)	Centro de Desarrollo de la Industria Automotriz en México (CeDIAM). Noticias, August 5, 2005. ITESM University
C	Volkswagen de México (2005)	*Estudio de Diseño*. [Design Study] retrieved August 2, 2005 from http://www.vw.com.mx/CWE/volkswagen/Planta/PLA002Planta/0,1591,09020308,00.html
C	Volkswagen de México, S.A. de C.V. and Casa de Bolsa BBVA Bancomer, S.A. de C.V. (June, 2003)	Programa de Certificados Bursátiles. No. DGE-370-4170
C	Diaz, F. (2004, October)	*Procesos Globales y su Relación con la Industria Automotriz: Caso Ford de México*. [Global Processes and their Relation with the Automotive Industry: The Case Ford Mexico]. Foro sobre Globalización y Modernización de la Industria Manufacturera de Exportación, October.
C	Gutierrez, G. (2004, September)	*Globalización de los Procesos Productivos e Identificación de Oportunidades en México: Delphi* [Globalization of the Productive Processes and Identification of Opportunities in Mexico: Delphi]. Foro sobre Globalización y Modernización de la Industria Manufacturera de Exportación, September.
C	Laguna, V. (2004, September)	*Alianzas Estratégicas en el Sector Automotriz: GM Mexico* [Strategic Alliances in the Automotive Sector]. Foro sobre Globalización y Modernización de la Industria Manufacturera de Exportación, September.
G	Bancomext (2004)	*Business Opportunities, 2004: The Automotive Industry In Mexico*. Invest in Mexico, Bancomext www.investinmexico.com.mx
G	Centro de Capital Intelectual y Competitividad(CECIC) (2002).	*Coahuila Competitivo 2020* [Coahuila Competitiveness 2020]. Coahuila: Author.
G	Direccion General de Inversion Extranjera (2004)	*Inversion Extranjera Directa en la Industria Automotriz* [Foreign Direct Investment in the Automobile Industry]. December. Mexico: Secretaria de Economia
G	Instituto de Geografía, Estadística, e Informática (INEGI) (2005)	*La Industria Automotriz en Mexico, Ed. 2004*. Aguascalientes: Author
G	Instituto de Investigaciones Legislativas del Senado de la Republica (IILSEN), (2003)	La Industria Automotriz en el Tratado de Libre Comercio de America del Norte: Implicaciones para Mexico. [The Mexican Automotive Industry in the NAFTA: implications for Mexico]. Senado de la República Mexicana.
G	Secretaria de Economia (2004)	*El TLCAN y el Sector de Equipo de Transporte y Autopartes* [NAFTA and the Sector of Transport Equipment and Auto parts]. Mexico: Author.
G	Secretaria de Economia (2004)	*Mexico: Negociaciones Comerciales Internacionales* [International Trade Negotiations]. May, Mexico: Author.
G_U.S.	U.S. Department of Commerce (2004)	U.S. Automotive Parts Industry 2004 Annual Assessment
IA	Industria Nacional de Autopartes (INA). (2004)	The Importance of the Automotive Industry in Mexico. Congreso Internacional de la Industria Automotriz en México, 2004.
IA	Suarez, R. (2005)	Mexico: Automotive Parts Industry. Mexican Auto parts Association (INA)
M	Rojas, F.(2004)	*Hacia una Profunda Reestructuración del Mercado de Repuesto* [Toward a Deep Reestructuration of the Auto parts' Aftermarket]. Twentieth Expo Internacional RUJAC 2004, Jalisco. Retrieved August 4, 2005 from www.amdajal.com.mx/noticia25.asp
M	Luna, C. (2004)	Crucial el Próximo año para la Industria Automotriz. *Vértigo*, September
M	Tecnología (2005, June)	Ya Suman 144 Inventos desde 1999 [There are 144 invents so far, since 1999]. *Alianza Automotriz*, No.315.
M	Tovar, E. (2000, March)	VW de México a Toda Marcha. [VW of Mexico at High Speed]. *Metalmecánica*, March, 2000.
M	Tovar, E. (2000, November)	Los 50 Autopartistas más Grandes de America Latina en el Año 1999. *Metalmecánica*, November.
M	Tovar, E. (2001, November)	Los 50 Autopartistas más Grandes de America Latina en el Año 2000. *Metalmecánica*, November.
M	Tovar, E. (2002, October)	Los 50 Autopartistas más Grandes de America Latina en el Año 2001. *Metalmecánica*, October.
M	Equipo Editorial (2003, September)	Los 50 Autopartistas más Grandes de America Latina en el Año 2002. *Metalmecánica*, September.
M	Equipo Editorial (2004, October)	Los 50 Autopartistas más Grandes de America Latina en el Año 2003. *Metalmecánica*, October.

Appendix 1 …Continuation

Type	Author/year	Document
NGO	Brown, F. (2000)	La industria automotriz mexicana: reestructuración reciente y perspectivas, *Proyecto CEPAL/CIID CAN 97/S25, Reestructuración industrial, innovación y competitividad internacional en América Latina* , Fase II, Santiago de Chile
NGO	Economic Commision for Latin America and the Caribbean (ECLAC) (2000)	*Foreign Investment in Latin America and the Caribbean, 1999* , Santiago, Chile. United Nations publication
NGO	Economic Commision for Latin America and the Caribbean (ECLAC) (2004)	*Foreign Investment in Latin America and the Caribbean, 2003* (LC/G.2226-P/I), Santiago, Chile, May. United Nations publication
NGO	Ramirez De la O, R. (2002)	Mexico: NAFTA and the Prospects for North American Integration. *C.D. Howe Institute Border Papers*, 173
R	Carrillo, J. (1997)	Maquiladoras automotrices en México: clusters y competencias de alto nivel. In M. Novick and M.A. Gallart.(Eds.), *Competitividad, redes productivas y competencias laborales*, pp.193-234. *Mexico:* Centro Interamericano de Investigación y Documentación Sobre Formación Profesional.
R	Carrillo, J. (2000)	The Integration of the Mexican Automobile Industry to the U.S.A.: Between Policies and Corporate Strategies. *Actes du GERPISA* No.28, February, p.55-77.
R	Carrillo, J. (2004)	Transnational Strategies and Regional Development: the Case of GM and Delphi in Mexico, *Industry and Innovation* , 11(1), 127.
R	Carrillo, J. and Gonzalez Lopez, S. (1999)	Relaciones Cliente-Proveedor de Empresas Automotrices Alemanas en México. [Relations Client-Supplier of German Auto Firms in Mexico]. *Actes du GERPISA* No. 25, 93.
R	Carrillo, J. and Lara, A. (2003)	Industrial Evolution of the Auto Part Sector in Mexico and Changes in the Division Labor, Eleventh GERPISA International Colloquium, June.
R	Chambers, E.J. and Smith, P.H. (2002)	NAFTA in the New Millenium: Questions and Contexts. In E.J. Chambers and P.H. Smith (Eds), *NAFTA in the New Milenium* (p.331-353). La Joya, CA: Center for U.S.-Mexican Studies; Edmonton: University of Alberta Press
R	Gereffi, G. (2003)	Mexico's Industrial Development: Climbing Ahead or Falling Behind in the World Economy?. In K.J. Middlebrook and E. Zepeda (Eds), *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges* (p.195-240). Stanford, California: Stanford University Press.
R	Gonzalez Lopez, S. (2000)	Estrategias Corporativas y Espacios Locales: Las Empresas Automotrices en la Zona de Toluca, Mexico [Corporate Strategies and Local Spaces: The Automotive enterprises in Toluca Zone, Mexico]. *Actes du GERPISA* , No.29, 69.
R	Juárez, H. (2001)	Nuevas Integraciones Industriales en la Industria del Automóvil en México: El Caso de la Fábrica Modular II [New Industrial Integration within the Automotive Industry in Mexico: The Case of the Modular Factory II]. *Trabajadores en Linea* , May-June, 24,
R	Mattar, J., Moreno-Brid, Juan C., and Peres, W.(2003)	Foreign Investment in Mexico after Economic Reform. In K.J. Middlebrook and E. Zepeda (Eds), *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges* (p. 123-160). Stanford, California: Stanford University Press.
R	Middlebrook, K.J. and Zepeda (2003)	On the Political Economy of Mexican Development Policy. In K.J. Middlebrook and E. Zepeda (Eds), *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges* (p. 162-194). Stanford, California: Stanford University Press.
R	Prentice, B.E. and Ojaj, M. (2002)	Transportations: Bottlenecks and Possibilities. In E.J. Chambers and P.H. Smith (Eds), *NAFTA in the New Milenium* (p.331-353). La Joya, CA: Center for U.S.-Mexican Studies; Edmonton: University of Alberta Press
R	Pries, L. (1999)	The Dialectics of Automobile Assemblers and Suppliers Restructuring and Globalization of the German "Big Three". *Actes du GERPISA* No. 25, 77.
R	Pries, L. (2000)	Reestructuración Productiva y Estrategias de Aprovisionamiento: el Caso de la Volkswagen de México en la Región de Puebla. [Productive reestructuring and sourcing stategies: the Case Volswagen in Puebla Region]. *Region y Sociedad* , 12(19), 161.
R	Valdes, J.L. (2002)	NAFTA and Mexico: A Sectoral Analysis. In E.J. Chambers and P.H. Smith (Eds), *NAFTA in the New Milenium* (p.61-82). La Joya, CA: Center for U.S.-Mexican Studies; Edmonton: University of Alberta Press
R	Vega, G. and De la Mora, L.M. (2003)	Mexico's Trade Policy: Financial Crisis and Economic Recovery. In K.J. Middlebrook and E. Zepeda (Eds), *Confronting Development: Assessing Mexico's Economic and Social Policy Challenges* (p. 162-194). Stanford, California: Stanford University Press.

C: Companies' reports, **G**: Government, **IA**: Industry Association, **M**: Magazines, **NGO**: Non-Government Organizations, and **R**: Researchers' works

Appendix 2: Email Invitation to participate in the Telephone Interview

To whom it may concern
Company's Name

Hello, my name is Salvador Barragan. I am a Mexican citizen working toward my Master of Science in Management degree at the University of Lethbridge in Canada. I would like to invite you to participate in a Telephone Interview for my thesis research project about **the competitiveness of the automobile and auto parts industries in Mexico after 10 years of NAFTA.**

The purpose of this study is to understand the relations among the car assemblers and the auto parts supply companies, as well as the sources of competitiveness for the entire industry. In addition, I would like to better understand how the Automotive Cluster in the State of Puebla and surrounding areas has benefited local and indigenous industries in terms of competitiveness, technology transfer, management skills, cooperation and learning.

I attach a "Formal Invitation Letter" from my Supervisor Dr. John Usher, in which he explains in more detail additional information about this study, the interview process, the confidentiality of the interview, and contact information.

Please email me back if you consent to participate in a Telephone Interview. Your help will be greatly appreciated.

Thanks in advance,

Salvador Barragan
MSc in management student
University of Lethbridge,
Lethbridge, AB, Canada.

Email: salvador.barragan@uleth.ca
Phone: (403)-329-2162

Appendix 3: Formal Invitation Letter

2005/July/9

To Whom It May Concern:
Company's name

Thank you for considering our invitation to participate in a Telephone Interview for our research project about **the competitiveness of the automobile and auto parts industries in Mexico after 10 years of NAFTA** underway at the University of Lethbridge in Alberta, Canada. This study is being conducted by Salvador Barragan, a Mexican student in our Master of Science in Management program.

As noted by Salvador in his email, the **purpose** of this study is to understand the relations among the car assemblers and the auto parts companies, as well as the sources of competitiveness for the entire industry. In addition, we hope to better understand the extent to which the Automotive Cluster in the State of Puebla has benefited local and indigenous industries in terms of competitiveness, technology transfer, management skills, cooperation and learning.

Please note the following points from our **research protocol of**:
1) The Telephone Interview will take around 40 minutes.
2) Salvador will ask you a list of prepared questions and he will take notes.
3) The benefits of this project are primarily academic but may have both policy and practical implications. If you are interested, a summary of the findings will be available in about six months and you may contact either me or Salvador for a copy.
4) We will protect the confidentiality of you and your company by only stating in the final report that *"Interviews were conducted with managers from the auto parts industry within the automobile Cluster in Puebla, Mexico and surrounding areas."*
5) If there is a need to quote part of your comments, we will ask you for further approval, while continuing to maintain your and your company's anonymity.
6) You have the right to not participate or withdraw at any time, even during the interview.
7) The information that you provide will used in Salvador's thesis and for subsequent publication in an academic journal.

If you consent to participate, please email me or Salvador Barragan to set an appointment date and time for the telephone interview.

If you have any questions about the study, please call me (phone: 403-329-2759; email: john.usher@uleth.ca) or Salvador Barragan (phone:403-329-2162; email: salvador.barragan@uleth.ca) at the University of Lethbridge. Questions of a more general
Nature may be addressed to the Office of Research Services, University of Lethbridge (phone: 403-329-2747).

Thank you greatly for your cooperation,

John M. Usher

John M. Usher, PhD
Professor of Strategy and Org Theory
Faculty of Management
University of Lethbridge

Appendix 4: Interview Guide

Interview Guide for Managers or Representatives of the automobile industry and auto parts industry in the Cluster of Volkswagen de Mexico (VWM) in Puebla, Mexico. This guide will be altered (wording changed, applied questions dropped) for interviewees in government or industry associations. These will not be substantive changes.

General Questions about the interviewee:

1) What is your position in the company?

2) How long have you been in the company? How long in the industry?

General Questions about the automobile industry in Mexico:

3) Describe the government's role in promoting the development of this industry.
    a. NAFTA
    b. FDI law
    c. Other incentives
    d. Financial support
    e. Development of basic infrastructure
    f. Development of related infrastructure
    g. Research institutes or university-industry research

4) Can you talk about the industry, before NAFTA was signed?

5) Can you explain the differences in the hierarchy of suppliers in the automobile supply chain? (Tier 1, 2, 3)
    a. Characteristics
    b. Level of technology and capability
    c. Level of co-operation or integration among them

Questions about the Cluster Volkswagen Mexico (VWM)

6) Dou you know if indigenous industries within the Cluster VWM meet the characteristics to be Tier 1 or Tier 2?
    a. Capacity to supply long term contracts
    b. Quality certifications (QS, ISO, VDA 6.1, TQM Systems)
    c. Technology upgrade, automation, CNC
    d. Statistical Process Control (SPC)

7) What other indigenous industries have benefited from the presence of the VWM and global auto parts suppliers in the Cluster VWM?

8) Does your company have indigenous suppliers within the Cluster VWM? Or outside? Proportion with foreign owned suppliers?

9) Can you describe some characteristics of one of your indigenous suppliers, in terms of:

    a. Certifications
    b. Technology, know-how
    c. Just-in-time or TQM systems
    d. Capability

10) What are the main obstacles for the indigenous suppliers, to become your suppliers?

11) How would you explain the benefits of being inside a cluster?
    a. Learning
    b. Cooperation
    c. Trade associations
    d. Research institutions
    e. Sources of competitive suppliers
    f. Availability of engineers and skill technicians
    g. Other advantages

12) In the next five years, does your company have plans to increase the number of local suppliers?
    a. Any program to develop local suppliers?

Two final general questions

13) What are the future challenges for Mexican suppliers to move to the next level of competitiveness?

    a. Skills and managerial practices
    b. Technology, know how
    c. Capital, credit
    d. Infrastructure

14) Are there any other questions that I should ask you about the auto parts industry to better understand the obstacles or dynamics for the competitiveness of the industry?

→ Can I contact you again in case I want to clarify some of the information that you provide me in this interview?

Appendix 5: Mexico's Share of Total World Exports, Selected Industries

Exports from Mexico to the World (US dollars)

	1990	1991	1992	1993	1994	1995	1996	1997
7812	2,614,143,488	3,784,360,704	3,368,307,968	4,242,480,896	5,050,844,160	7,521,751,040	9,672,988,672	9,700,077,568
7821	21,997,752	163,561,696	586,838,976	669,201,024	817,075,968	1,850,104,064	3,422,247,168	3,985,018,880
784	416,801,088	490,836,160	1,602,836,992	2,013,789,056	2,307,452,416	2,498,895,104	2,976,076,800	3,462,084,608

Total Exports from the World

	1,990	1,991	1,992	1,993	1,994	1,995	1,996	1,997
7812	166,440,232,960	170,276,546,560	190,613,056,512	184,555,937,792	205,799,214,080	230,745,631,744	245,737,779,200	259,044,429,824
7821	31,891,530,496	33,300,627,200	36,000,192,384	33,394,127,744	37,627,841,664	41,260,690,688	44,987,617,536	50,192,756,736
784	79,610,080,256	79,413,854,720	91,976,744,960	82,223,500,288	97,215,917,568	112,290,806,272	117,831,558,656	123,013,334,016

Mexico's Share of Total World Exports

		1990	1991	1992	1993	1994	1995	1996	1997
7812	**Cars**	1.57%	2.22%	1.77%	2.30%	2.45%	3.26%	3.94%	3.74%
7821	**Light Trucks**	0.07%	0.49%	1.63%	2.00%	2.17%	4.48%	7.61%	7.94%
784	**Autoparts**	0.52%	0.62%	1.74%	2.45%	2.37%	2.23%	2.53%	2.81%

Source : Based on United Nations Statistics Division Data, retrieved June 10, 2005 from http://unstats.un.org/unsd/comtrade/

Exports from Mexico to the World (US dollars)

	1998	1999	2000	2001	2002	2003
7812	10,974,162,944	12,407,464,960	16,296,729,600	15,297,572,864	13,948,073,984	12,546,163,712
7821	3,577,820,160	4,101,383,936	4,815,561,728	6,447,020,544	6,349,102,080	6,638,888,448
784	4,173,732,864	5,107,855,360	5,812,523,008	5,579,811,840	6,608,496,128	7,009,161,728

Total Exports from the World

	1,998	1,999	2,000	2,001	2,002	2,003
7812	276,911,894,528	292,386,629,632	299,876,057,088	306,880,356,352	336,780,550,144	392,066,594,816
7821	49,944,404,992	49,393,860,864	52,824,928,256	52,028,200,448	53,971,780,096	63,296,602,624
784	126,890,417,152	133,851,447,296	142,033,902,592	137,156,492,288	150,671,457,280	178,711,644,160

Mexico's Share of Total World Exports

		1998	1999	2000	2001	2002	2003
7812	**Cars**	3.96%	4.24%	5.43%	4.98%	4.14%	3.20%
7821	**Light Trucks**	7.16%	8.30%	9.12%	12.39%	11.76%	10.49%
784	**Autoparts**	3.29%	3.82%	4.09%	4.07%	4.39%	3.92%

Source : Based on United Nations Statistics Division Data, retrieved June 10, 2005 from http://unstats.un.org/unsd/comtrade/

Appendix 6: Auto parts (SITC 784) Balance Trade Mexico-World

	1990	1991	1992	1993	1994	1995	1996	1997
Exports	416,801,088	490,836,160	1,602,836,992	2,013,789,056	2,307,452,416	2,498,895,104	2,976,076,800	3,462,084,608
Imports	408,827,360	513,329,472	832,660,992	905,054,016	1,342,969,984	3,103,869,952	5,578,850,304	6,638,303,232

Source : Based on United Nations Statistics Division Data. http://unstats.un.org/unsd/comtrade/

	1998	1999	2000	2001	2002	2003
Exports	4,173,732,864	5,107,855,360	5,812,523,008	5,579,811,840	6,608,496,128	7,009,161,728
Imports	6,660,192,768	7,908,128,256	10,335,113,216	10,068,454,400	9,813,117,952	9,187,189,760

Source : Based on United Nations Statistics Division Data. http://unstats.un.org/unsd/comtrade/

Appendix 7: Top Exporters, Cars - SITC 7812 (1993 and 2003)

1993			
Rank Export Value 1993	**Country**	**Exports**	**Share of Total World Exports**
1	Japan	$47,129,690,112	25.5%
2	Germany	$35,458,588,672	19.2%
3	Canada	$19,024,320,512	10.3%
4	USA	$14,824,305,664	8.0%
5	Belgium-Luxembourg	$14,214,185,984	7.7%
6	France	$12,299,039,744	6.7%
7	Spain	$9,883,098,112	5.4%
8	United Kingdom	$6,530,148,864	3.5%
9	Italy	$4,627,710,976	2.5%
10	**Mexico**	**$4,242,480,896**	**2.3%**
11	Rep. of Korea	$3,883,984,640	2.1%
	Others	$16,322,368,599	8.8%
	Total Export:	**$184,555,938,135**	100.0%

2003			
Rank Export Value 2003	**Country**	**Exports**	**Share of Total World Exports**
1	Germany	$91,509,436,000	20.0%
2	Japan	$68,293,226,496	14.9%
3	Canada	$31,174,668,479	6.8%
4	France	$30,118,133,760	6.6%
5	Belgium	$24,398,018,560	5.3%
6	Spain	$22,979,379,759	5.0%
7	USA	$22,385,909,760	4.9%
8	United Kingdom	$18,571,968,301	4.1%
9	Rep. of Korea	$17,534,568,448	3.8%
10	**Mexico**	**$12,546,163,712**	**2.7%**
11	Italy	$8,095,179,257	1.8%
12	Sweden	$6,485,355,008	1.4%
13	Slovakia	$4,027,661,568	0.9%
14	Austria	$3,719,198,464	0.8%
	Others	$95,839,194,213	20.9%
	Total Export:	**$457,678,061,785**	100.0%

Source : Author's calculations based on United Nations Statistics Division Data, retrieved June 15, 2005 from http://unstats.un.org/unsd/comtrade/

Appendix 8: Top Exporters, Light Trucks - SITC 7821 (1993 and 2003)

1993			
Rank Export Value 1993	**Country**	**Exports**	**Share of Total World Exports**
1	Japan	$8,917,170,176	26.7%
2	Canada	$7,672,599,040	23.0%
3	USA	$3,264,491,264	9.8%
4	Germany	$2,898,029,056	8.7%
5	United Kingdom	$1,311,044,736	3.9%
6	Italy	$1,177,999,360	3.5%
7	Sweden	$1,177,190,016	3.5%
8	France	$1,129,865,728	3.4%
9	Belgium-Luxembourg	$932,344,576	2.8%
10	Spain	$694,563,200	2.1%
11	**Mexico**	**$669,201,024**	**2.0%**
12	Brazil	$493,545,184	1.5%
13	Austria	$473,851,616	1.4%
14	Netherlands	$461,050,240	1.4%
15	China, Hong Kong SAR	$367,945,312	1.1%
	Others	$1,753,237,525	5.3%
	Total Export:	**$33,394,128,053**	100.0%

2003			
Rank Export Value 2003	**Country**	**Exports**	**Share of Total World Exports**
1	Canada	$9,135,187,245	13.3%
2	USA	$7,282,280,960	10.6%
3	Germany	$7,229,693,000	10.5%
4	Japan	$6,679,833,088	9.7%
5	**Mexico**	**$6,638,888,448**	**9.6%**
6	France	$3,714,265,600	5.4%
7	Spain	$3,597,303,752	5.2%
8	Italy	$3,029,894,958	4.4%
9	Belgium	$2,736,427,520	4.0%
	Others	$18,831,867,318	27.3%
	Total Export:	**$68,875,641,889**	100.0%

Source : Author's calculations based on United Nations Statistics Division Data, retrieved June 15, 2005 from http://unstats.un.org/unsd/comtrade/

Appendix 9: Top Exporters, Auto parts - SITC 784 (1993 and 2003)

1993			
Rank Export Value 1993	**Country**	**Exports**	**Share of Total World Exports**
1	USA	$19,710,967,808	24.0%
2	Japan	$15,326,025,728	18.6%
3	France	$7,929,907,712	9.6%
4	Germany	$7,783,051,776	9.5%
5	Canada	$6,984,554,496	8.5%
6	Italy	$3,878,584,064	4.7%
7	United Kingdom	$3,636,550,400	4.4%
8	Spain	$2,284,557,824	2.8%
9	**Mexico**	**$2,013,789,056**	**2.4%**
10	Sweden	$1,850,709,120	2.3%
	Others	$10,824,802,277	13.2%
	Total Export:	**$82,223,500,261**	100.0%

2003			
Rank Export Value 2003	**Country**	**Exports**	**Share of Total World Exports**
1	USA	$28,326,993,920	15.9%
2	Germany	$25,694,467,000	14.4%
3	Japan	$20,204,279,808	11.3%
4	France	$14,099,529,728	7.9%
5	Canada	$12,141,076,820	6.8%
6	Italy	$9,818,822,796	5.5%
7	Spain	$8,979,456,503	5.0%
8	**Mexico**	**$7,009,161,728**	**3.9%**
9	United Kingdom	$6,984,717,903	3.9%
	Others	$52,439,562,590	29.3%
	Total Export:	**$178,713,350,893**	100%

Source : Author's calculations based on United Nations Statistics Division Data, retrieved June 15, 2005 from http://unstats.un.org/unsd/comtrade/

Appendix 10: Mexico's Vehicles Production, Domestic, Imports, and Exports (1990-2003)

(thousands of units)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Production	803.7	960.9	1051.2	1055.2	1,097.4	931.2	1,211.3	1,339.3	1,427.6	1,493.7	1,889.5	1,817.8	1,774.4	1,540.6
Production Domestic Market	526.8	610.2	662.5	583.7	530.3	150.1	235.9	356.3	455.6	420.1	455.4	414.1	448.6	370.4
Imports	5.4	9.4	8.8	8.5	74	34.3	80.2	135.1	196.2	245.7	402.7	473	538.1	607.5
Exports	276.9	350.7	388.7	471.5	567	781	975	983	972	1,074	1,434	1,404	1,326	1,170

Source : Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx

(Percentage of units produced)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Production	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Production Domestic Market	66%	64%	63%	55%	48%	16%	19%	27%	32%	28%	24%	23%	25%	24%
Imports	1%	1%	1%	1%	7%	4%	7%	10%	14%	16%	21%	26%	30%	39%
Exports	34%	36%	37%	45%	52%	84%	81%	73%	68%	72%	76%	77%	75%	76%

Source: Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx (Data on Appendix 10)

Appendix 11: Sales of Cars to the Final Customer in Mexico

(in units)

Companies	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
acura	0	0	0	0	0	0	0	0	0	0	63
audi	0	0	0	195	1,041	1,754	2,392	3,082	3,625	2,866	3,610
bmw	0	258	1,133	1,604	2,059	2,675	4,467	6,116	5,506	4,461	5,059
daimlerchrysler	95,383	36,461	54,499	67,319	92,299	90,675	111,755	130,449	115,501	99,949	115,744
ford motor	89,715	41,857	66,048	95,134	110,343	113,879	143,769	160,202	160,483	158,591	177,825
general motors	113,593	48,002	89,202	143,303	174,900	176,257	216,658	205,726	230,636	217,965	243,748
honda	0	69	1,896	5,971	12,534	18,859	24,482	28,276	30,430	29,016	29,667
jaguar	0	0	0	0	114	253	326	887	1,400	764	659
land rover	0	0	0	0	0	0	0	760	945	760	800
lincoln	0	0	0	0	0	0	0	0	0	2,549	2,746
m benz	689	1,027	1,216	1,152	1,206	2,493	2,887	3,779	3,312	3,313	3,830
m benz vans	0	0	0	0	0	0	0	0	113	908	2,384
mg rover	0	0	0	0	0	0	0	0	0	797	775
mini	0	0	0	0	0	0	0	0	1,545	1,801	1,750
mitsubishi	0	0	0	0	0	0	0	0	0	3,922	10,647
nissan	129,289	52,401	59,620	93,816	139,518	134,937	173,066	190,537	211,648	214,011	234,853
peugeot	0	0	0	0	0	1,505	3,454	6,139	9,148	13,353	16,308
porsche	0	0	32	20	13	9	9	185	282	347	452
renault	0	0	0	0	0	0	0	3,150	15,386	18,431	24,091
seat	0	0	0	0	0	0	0	11,843	25,116	22,130	22,704
smart	0	0	0	0	0	0	0	0	0	141	403
toyota	0	0	0	0	0	0	0	0	0	9,839	23,876
volkswagen	161,261	46,241	51,508	73,632	109,333	123,689	169,111	165,323	159,782	169,235	170,449
volvo	0	0	0	0	0	303	1,399	2,381	2,700	2,721	3,353
Total	**589,930**	**226,316**	**325,154**	**482,146**	**643,360**	**667,288**	**853,775**	**918,835**	**977,558**	**977,870**	**1,095,796**

Source: Author's estimations based on data from Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx

Note: Includes Imported cars

Appendix 12: Cars Sales in Mexico, By Region

(in units)

Origin	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Asian	129,289	52,470	61,516	99,787	152,052	153,796	197,548	218,813	242,078	256,788	299,106
European	161,950	47,526	53,889	76,603	113,652	132,428	183,719	201,998	226,515	239,707	254,393
North American	298,691	126,320	209,749	305,756	377,656	381,064	472,508	498,024	508,965	481,375	542,297
Total	**589,930**	**226,316**	**325,154**	**482,146**	**643,360**	**667,288**	**853,775**	**918,835**	**977,558**	**977,870**	**1,095,796**

Source: Author's calculations based on data from Mexican Automotive Manufacturers Association (AMIA): www.amia.com.mx
Note: Includes Imported cars

Appendix 13: Main Tier 1 Suppliers in Mexico, NORTH WEST

BAJA CALIFORNIA	PARKER HANNIFIN	SONORA
AMERICAN EAGLE WHEEL	PILKINGTON	ALLIED SIGNAL
AMERICAN RACING	PIONEER	AMER MEX PRODUCTS
ATC DISTRIBUTION GROUP	PRIME	ATRONICS
AUTOLIV	QUALITY POLISHING INT.	BENTELER
BOSCH	THE BUDD COMPANY	BREED TECHNOLOGIES
COTO TECHNOLOGIES	THOMSON INDUSTRIES	CHAHTA ENTERPRISE
COVERCRAFT INDUSTRIES	TT ELECTRONICS	CHARLES E. GILLMAN
ECO-AIR PRODUCTION	VISHAY ELECTRONICS	DELPHI AUTOMOTIVE
ENERGY LABS	WABASH TECHNOLOGIES	EXEMPLAR MANUFACTURING
FURUKAWA ELECTRIC	WATKINS MANUFACTURING	HYDRO NORTH AMERICA
GONHER		ITT INDUSTRIES
HIKAM ELECTRONICA	**SINALOA**	LEONI WYRING SYSTEMS
HONEYWELL	SELMEC	MOLEX
HOOKER INDUSTRIES	SUMITOMO	NOMA AUTOMOTIVE
HYUNDAI TRANSLEAD	DELPHI	OXFORD AUTOMOTIVE
INTERNATIONAL RECTIFIERS	WALBRO ENGINE MANAGEMENT	PRESTOLITE WIRE CORP.
ISOCLIMA AMERICA	MEXICORVOS	ST. CLAIR TECHNOLOGIES
KAMITA INTERNATIONAL		TAKATA
KYOCERA	**DURANGO**	THE INTEC GROUP
LEVITON	ELECTRIC DE DURANGO (GRUPO ARMAS)	TRW
MANIK MOTORS	LINAMAR	TSE BRAKES
MARKO FOAM PRODUCTS	SUMITOMO	TYCO ELECTRONICS
MATSUSHITA-AROMAT	YAZAKI NORTH AMERICA	VELCRO
MORGAN POLIMER SEALS		WALBRO (TI AUTOMOTIVE)
NKS SAFETY TECHNOLOGY		YAZAKI

Source: Suarez, R.(2004). *The Automotive Parts Industry* . INA

Appendix 14: Main Tier 1 Suppliers in Mexico, NORTH EAST

COAHUILA	ARVIN MERITOR	CAPSONIC AUTOMOTIVE	DELPHI ALAMBRADOS AUTOM.
A.O. SMITH	AUTOCLIMAS	CARLISLE	EATON
ALCOA FUJIKURA	AUTOM. WIRE HARNESSES	COILCRAFT	FERMAG
ALLIED SIGNAL-HONEYWELL	CAMISA	COOPER INDUSTRIES	FUJITSU TEN
AUTOTEK INDUSTRIAL DE MEX.	CARPLASTIC	CRONI	GLOBE MOTORS
BENTELER	CARUSI	CUMMINS DIESEL	GODAM
BROWN CORPORATION	CATERPILLAR	DANA CORP.	GSW MANUFACTURING
CASTECH	CNW	DELMEX DE JUAREZ	HAYES LEMMERZ INT.
CATERPILLAR	DANA	DELPHI	INVENSYS
CIFUNSA	DELPHI	EAGLE OTTAWA	ITT AUTOMOTIVE
CITATION TOOLS	DENSO	EATON	KIMKO
CNI, INC.	DONNELY	ELECTRISOLA	KONGS BERG AUTOMOTIVE
COOPER STANDARD	ENERTEC MEXICO	FEDERAL MOGUL	MATSUSHITA ELECTRONIC COMP.
DELPHI DIESEL SYSTEMS	GE	GOODYEAR TIRE & RUBBER	MIKUNI TEXAS
DOUGLAS & LOMASON	GONHER	HAYES WHEELS ALUMINIO	MINNESOTA RUBBER
FEDERAL MOGUL	GOODMANS	HOMELITE	MODINE
FINDLAY INDUSTRIES	GOODYEAR	HONEYWELL	NAFTEK
FLAMBEAU PLASTICS	GUNTNER	I.T.E.S.A.	PARKER HANNIFIN
FOAMEX CORPORATION	HAYES LEMMERZ INT.	ITT AUTOMOTIVE	PRECISION CABLE MANUF.
GENERAL DE CABLE MEX.	HOLLANDER	JOHNSON CONTROLS	PULLMEX
GM PROCESSING	HUSSMAN	KENWOOD	SAINT-GOBAIN
IRVIN AUTOMOTIVE	JOHN DEERE	KEY PLASTICS	SIEMENS
JOHN DEERE	KEY PLASTICS	LEAR CORPORATION	STANDARD MOTOR PRODUCTS
JOHNSON CONTROLS	LEAR CORP.	LEONI CABLE	TELEFLEX
KAY AUTOMOTIVE	LORD CORP.	LETTS INDUSTRIES	TENNECO AUTOMOTIVE
LAGERMEX	METALSA	MANESA	TI AUTOMOTIVE
LEAR SEATING	MITSUBA	MORAINE	TROSTEL
LINAMAR	MITSUBISHI	NICHIRIN COUPLER	TRW ELECTRONICA ENSAMBLES
MAGNA INTERNATIONAL	MOTO REDUCTORES US	ROBERT BOSCH	TRW VEHICLE SAFETY SYSTEMS
MAGNA SEATING SYSTEMS	NEMAK	SATURN ELECTRONICS	UNIROYAL CHEMICAL
MAHLE PISTONES	PARKER ZENITH	SETON	UNITED TECHNOLOGIES
MANNESMANN-SACHS AG	PIOLAX	SHELDAHL TECHNOLOGIES	VALEO
MASCO TECH	PIONEER	SIEMENS	VALEO SYLVANIA
METALDYNE	SIEMENS	SSI TECHNOLOGIES, INC.	VELVAC
OXFORD AUTOMOTIVE	SUMITOMO	STONERIDGE	VISTEON
PILOT INDUSTRIES	TAKANISHI	STRATTEC SECURITY	WELLS MANUFACTURING
PLASTIC OMNIUM	TAKATA	SUMITOMO	
PSA WIRING PRODUCTS	TAPEX	SUPERIOR INDUSTRIES	
SAN LUIS RASINNI	TEKNIK	TDK USA CORP.	
TAKATA	THOMAS & BETTS	TRW OCCUPANT RESTRAINTS	
TECHNOTRIM	THOMAS BUILT BUSES	TRW STEERING WHEELS SYST.	
TENN-MEX	TI AUTOMOTIVE	TYCO INTERNATIONAL	
TEXTRON AUTOMOTIVE	TOKIO ELECTRICA	VALEO	
TWB	TOYOTA TSUSHO	VISHAY	
VEHYCO	VEGE DE MEXICO	VISTEON	
	VISTEON-CARPLASTIC	WARNER	
NUEVO LEON	VITRO	YAZAKI NORTH AMERICA	
A.O. SMITH CORP.			
ABB MEXICO	**CHIHUAHUA**	**TAMAULIPAS**	
ACCURIDE	A.O. SMITH CORP.	ALPINE ELECTRONICS	
AISIN SEIKI	ALCOA FUJIKURA	AMMEX PRODUCTS	
ALCOA FUJIKURA	AUMA	BBB INDUSTRIES	
ALLIED SIGNAL	AVON AUTOMOTIVE	BREED TECHNOLOGIES	
AMERICAN WHEELS	AVX CORPORATION	BRONCO ELECTRONICS	
ANCHORLOK	BERGEN CABLE	CATERPILLAR	
ARNECOM	BREED TECHNOLOGIES	DELCO	

Source: Suarez, R.(2004). *The Automotive Parts Industry* . INA

Appendix 15: Main Tier 1 Suppliers in Mexico, CENTRAL EAST and SOUTH

ESTADO DE MEXICO	DISTRITO FEDERAL	HIDALGO	KAUTEX TEXTRON
ABB MEXICO	ASSOCIATED SPRING	CITSA PPG	KIEKERT DE MEXICO
ANSORGE	BOCAR	CORTINAS Y PARASOLES AUTOMOTRICES	LAGERMEX
AUTOSEAT	BOSCH	ENGRANES DE HIDALGO	LUK
BARDAHL	CALSONIC	GLOBAL TRANSPORTE, INDUSTRIA SERVICIO	PARKER HANNIFIN
BASF	EATON	INDUSTRIA MANUFACTURERA DE REFACCIONES	PLASTIC OMNIUM
BOSCH	FIRESTONE	INDUSTRIAL DE PARTES PACHUCA	SIEMENS
CLEVITE	GONHER	INDUSTRIAL SAHAGUN	SKF
CRISTALES INASTILLABLES DE MEX.	GOODYEAR-OXO	INDUSTRIALES EN FIBRA DE VIDRIO	SOMMER ALLIBERT INDUSTRIES DE MEX.
DANA HEAVY AXLES	HITCHINER MANUFACTURING	INDUSTRIAS RAVIC	TENNECO
EAN SA	MANN HUMMEL	MANUFACTURERAS AUTOELECTRICAS	THYSSENKRUPP METALURGICA
EATON	METALDYNE	MANUFACTURAS G	THYSSENKRUPP PRESTA
ECHLIN	MICHELIN CORPORATION	MAENA	TRW SISTEMAS DE DIRECCIONES
FEDERAL MOGUL	MODINE/MEXPAR		
FPA	MORESA INDUSTRIAL	**TLAXCALA**	
GABRIEL DE MEXICO	NAL. DE CONDUCTORES	ARCOMEX	
GATES RUBBER	VITRO	AUNDE TEXEL	
GOODYEAR TIRE & RUBBER		CONDUMEX	
HAYES LEMMERZ	**MORELOS**	EMPRESAS CA-LE DE TLAXCALA	
HAYES WHEELS ACERO	BERU	EUWE EUGEN WEXLER	
HELLA KG HUECK & CO.	BRIDGESTONE	FORJAS SPICER	
HENKEL KGAA	FIRESTONE	GRAMMER AUTOMOTIVE	
INDUSTRIAS TAMER	FREUDENBERG-NOK DE MEX.	IDEAL ESTÁNDAR	
KRUPP HOESCH	SAINT-GOBAIN SEKURIT	JOHNSON CONTROLS	
LEAR CORPORATION	TEMIC	KEIPER	
LIBERTY MEXICANA		SAINT-GOBAIN	
LORD DE MEXICO	**VERACRUZ**	VMS FLOCKTECHNICK DE MEX.	
MAGNA INTERNATIONAL	AVON RUBBER P.L.C.		
PARKER HANNIFIN	SIEMENS	**PUEBLA**	
PERKINGS INDUSTRIES	TAMSA	AUTOCRISTALES DE ORIENTE	
SARNAMOTIVE BLUE WATER		AUTOTEK	
SEALED POWER MEXICANA	**CHIAPAS**	BENTELER	
SKD DE MEXICO	AXA YAZAKI	BREMBO RASSINI	
TI AUTOMOTIVE	**YUCATAN**	FEDERAL MOGUL	
TRELLEBORG YSH	AIR SYSTEM	FTE MEXICANA	
VALEO SYLVANIA	AIR TEMP	HP PELEZER AUTOMOTIVE SYSTEMS	
ZF HOLDING	AXA YAZAKI	JOHNSON CONTROLS	

Source: Suarez, R.(2004). *The Automotive Parts Industry* . INA

Appendix 16: Main Tier 1 Suppliers in Mexico, CENTRAL WEST COAST

AGUASCALIENTES	DANA HOSE & TUBING	QUERETARO	TREMEC
BOSCH	DANA LONG MANUFACTURING	ABC GROUP-CANADA	TRW SISTEMAS DE DIRECCIONES
BUSSCAR	DELCO REMY COMPONENTS	AMERICAN CAR EQUIPMENT	VALEO MATERIALES DE FRICCION
CALSONIC	DELCO REMY REMANUFACTURING	ARNESES ELECTRICOS AUTOM.	VAN ROB STAMPINGS
COOPER STANDARD	EAGLE-PICTURE INDUSTRIES	ARVIN DE MEXICO	VISTEON CLIMATE SYSTEMS
COROPLAST	EATON	ASPERMEX	WOCO
FORJAS Y MAQUINAS	EDSCHA	AUMA-TEC	
FRENADOS MEXICANOS	INDUSTRIAL BLAJU	AUTOLIV	**GUANAJUATO**
GESTAMP	ROBERT BOSCH	AUTOPARTES WALKER	AMERICAN AXLE
INDUSTRIA DE ASIENTO SUP.	THYSSENKRUPP SASA	BROSE	ARBOMEX
JATCO	VALEO SISTEMAS ELECTRICOS	BTICINO DE MEXICO	ARNESES ELECTRICOS AUTOM.
K & S MEXICANA	VALEO TERMICO	BYPASA (SAN LUIS RASSINI)	AUTOENSAMBLES Y LOGISTICAS
KANTUS		CLARION	AUTOLOG
MARCOPOLO	**JALISCO**	COLLINS & AIKMAN GROUP	AVENTEC
MORESTANA	AP TECNOGLASS DE MEX.	CORDAFLEX	BADER
MOTO DIESEL	AUTOPARTES ATR	DANA CORPORATION	CELAY
NABCO MEXICANA	BORGWARNER MORSE TEC MEX.	DELBAR PRODUCTS	ENERTEC MEXICO
OYAMSA	CARBU-PARTS	DELPHI	FERRANTI PACKARD
POLO MEX	CAUSAMEX	DURA AUTOMOTIVE SYSTEMS	FLEX N GATE
RESORTES MONTICELLO	CR MEXICANA	EATON	GKN PLC
SANOH INDUSTRIAL	EQUIPO AUTOMOTRIZ HELLA	FORJAS SPICER	GRUPO ANTOLIN
SEALED POWER MEXICANA	GRUPO FERRAU	FRENOS Y MECANISMOS	HUTCHINSON
SIEMENS	INDUSTRIAS DE ASIENTO SUP.	GRAMMER INDUSTRIAL	KASAI
UNIPRES MEXICANA	JABIL CIRCUIT DE MEXICO	GUARDIAN INDUSTRIES	LAGERMEX
YOROZU	K & S WIRE HARNESS	HARADA INDUSTRIES	LEAR CORPORATION
	MODINE/MEXPAR	HBA CAST PRODUCTS	MERIDIAN
ZACATECAS	PIONEER STANDARD	HI-LEX	MORESA (UNIKO)
AXA YAZAKI	ROCKWELL AUTOMOTIVE	INTERIORES PRINCE (JCI)	OXFORD AUTOMOTIVE
DELPHI CABLEADOS	ROLAMEX	IRIZAR	POLIMEROS Y DERIVADOS
ORO CONTROL	S & Z ROLMEX	JOHNSON MATTHEY	TENNECO AUTOMOTIVE
	SAARGUMMI	K.S.B. MEXICO	US MANUFACTURING
SAN LUIS POTOSI	SACHS BOGE	KOSTAL	VELCON
A. SHULMAN	SIEMENS VDO	MAGNA MIRROW SYSTEMS DE MEX.	
ALFRED ENGELMANN DE MEXICO	SUMIDA	MERITOR MEXICANA	
ARVIN MERITOR	SUNNINGDALE	NEW HOLLAND	
CONTINENTAL AG	SUPER DIESEL	NIHON PLAST	
CONTITECH	TAKATA	NORANDA	
CUMMINS DIESEL	TECNOPARTS	OMNI MANUFACTURING	
	VOGT ELECTRONICS	PPG INDUSTRIES	
	WEBB DE MEXICO	ROCKWELL	
	YAMAVER	SIEMENS	

Source: Suarez, R.(2004). *The Automotive Parts Industry* . INA

Appendix 17: Annual Average Remuneration in the Auto Assembly, Auto Parts, and Manufacturing Industries, in Mexico (1994-2003)

(In Current Mexican Pesos)

Industry	1994 /3	1995 /1	1996 /1	1997 /1	1998 /2	1999 /2	2000 /2	2001 /2	2002 /2	2003 /2
Manufacture Industry	26,722	31,372	38,515	46,223	55,135	65,062	75,874	85,400	92,530	97,650
Growth %		17.4%	22.8%	20.0%	19.3%	18.0%	16.6%	12.6%	8.3%	5.5%
Automobile Industry	57,935	65,119	72,587	92,018	109,896	129,036	155,195	176,081	182,035	189,605
Growth %		12.4%	11.5%	26.8%	19.4%	17.4%	20.3%	13.5%	3.4%	4.2%
Auto Parts Industry	27,375	32,193	40,891	49,110	57,839	69,741	82,154	93,039	100,522	100,848
Growth %		17.6%	27.0%	20.1%	17.8%	20.6%	17.8%	13.2%	8.0%	0.3%

Inflation Rate /5	**7.05%**	**51.97%**	**27.70%**	**15.72%**	**18.61%**	**12.32%**	**8.96%**	**4.40%**	**5.70%**	**3.98%**

/1 *Source* : INEGI (2002). Sistema de Cuentas Nacionales de México: Cuentas de bienes y servicios 1995-2000. Vol. I. Aguascalientes: Author.

/2 *Source* : INEGI (2005). Sistema de Cuentas Nacionales de México: Cuentas de bienes y servicios 1998-2003. Vol. I. Aguascalientes: Author.

/3 Based on Variation Percentage from: INEGI (2002). Sistema de Cuentas Nacionales de México: Cuentas de bienes y servicios 1995-2000. Vol. I. Aguascalientes: Author.

/4 Author's calculations

/5 *Source:* Banco de Mexico www.banxico.org.mx