The Sustainable Development of Industries:  
The Case of the Auto Industry in Mexico

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Supervisor
Philippe Debroux

12D0602
Juan Manuel Perez Debrand

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Abstract

The auto industry in Mexico is on an outstanding path of development. Mexico has been gaining international competitiveness thanks to entry of foreign direct investment and location advantages. In order to sustain this growth path, elements related to economic, social, environment, and governance dimensions are very important. This dissertation analyses the overall auto industry in Mexico and assess areas related to sustainable development.

The dissertation looks into the development path of the industry, the local labour market, Mexico’s diamond structure, and key stakeholders’ perception about sustainability. These areas are analysed to understand why the industry developed in certain manner, understand its status, and be able to suggest its future development path.

The development of the auto industry in Mexico during past decades has been positive. Automobile production and export growth support this view, while multinational companies’ desire and interest on establishing operations in Mexico, further contributes to the competitiveness of the country. Nevertheless, weak areas still exist. Observing the industry from the perspective of the ESEG sustainability dimensions served as tool to understand the stakeholders’ sustainability perception of the auto industry in Mexico.

The results suggest that the policies and strategies implemented at the beginning of the auto industry development served as one of the key factors that shaped its current state. Nevertheless, the opportunities to steer the development path still exist. In addition, Mexico lacks a comprehensive plan to develop the auto industry. Nevertheless, this weakness is being balance with important strengths that enhance Mexico’s potential. The results found can contribute to avoid externalities and post development costs. Mexico has the opportunity to take the structural changes of the industry as an advantage and develop a sustainable auto industry.

**Keywords:** Auto Industry, Sustainable Development, ESG, Mexico, Sustainability
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Abbreviations

AMIA  Mexican Automotive Industry Association
ANFAVEA  Brazilian Automobile Industry Association
ASEAN  Association of Southeast Asian nations
CAAM  China Association of Automobile Manufacturers
ESEG  Economic, Social, Environmental and Governance sustainability dimensions
ESG  Environmental, Social and Governance sustainability dimensions
EU  European Union
FDI  Foreign Direct Investment
FSA  Firms Specific Advantages
GATT  General Agreement on Tariffs and Trade
GDP  Gross Domestic Product
GM  General Motors
HBR  Harvard Business Review
HRD  Human Resources Development
HRM  Human Resources Management
JAMA  Japan Automobile Manufacturers Association
MERCOSUR Southern Common Market
MITI  Japanese Ministry of International Trade and Industry
NAFTA  North American free trade agreement
TAI  Thailand Automotive Institute
T&D  Training and Development
OECD  Organization for economic co-operation and development
OICA  International Organization of Motor Vehicle Manufacturers
R&D  Research and Development
UN  United Nations
VDA  German Association of the Automotive Industry
VW  Volkswagen
WB  World Bank
WTO  World Trade Organization
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Foreword

The purpose of the author is to contribute to the industrial development literature by analysing the synergy of the roles of the auto industry stakeholders, the private sector, policy makers, civil society and educational institutions, in the development process of the auto industry in an emerging country.

The main objective of this thesis is to explore the case of a growing industry in an emerging country and assess the conditions to develop the industry in a sustainable manner. Secondly, the author would like to present this PhD thesis as a proposal to industry analysts and policy makers in order to contribute their on-going efforts toward sustainable development.

Furthermore, the author would like to contribute in the creation of a modular set of indicators and analytical tools that can be used to assess the sustainability of any industry.

The case of the auto industry in Mexico has been selected due to the importance of the industry in Mexico and due to Mexico’s relevance in the development of the industry in the Latin American region and American Continent. The relative young stage of development of the industry in the context of an emerging developing country becomes an interesting opportunity to understand how an industry can develop in a sustainable manner.

The author takes in consideration the thesis contributions and the relation with Soka University principles and Soka Education humanistic values. For instance, the development of international competitiveness in the auto industry in a sustainable manner can ultimately contribute to the economic and social development of the country, as well, influences the life standard improvement of the overall society.
1. Introduction

Problem Identification

As the auto industry in Mexico develops and gains international competitiveness, elements related to the four sustainability dimensions (economic, social, environment, and governance) become more important. The dissertation aims to analyse the overall auto industry in Mexico and assess its prospects of changes in the short, medium, and long run.

The automotive industry includes automobiles, motorcycles, buses, and commercial trucks; however, this study concentrates on automobile segment of the auto industry. Furthermore, the study’s scope includes the overall value chain of the industry, which includes activities by different stakeholders such as automobiles manufacturers, parts and components suppliers, educational institutions and government.

In the last two decades, Mexico became an important manufacturing hub with significant location and production advantages. These advantages have been reinforced with access to important export markets, thanks to the large portfolio of free trade agreements available for products manufactured in Mexico. During the last decade, Mexico has enjoyed remarkable growth in the auto industry supported by increasing inflows of foreign direct investment (FDI).

The economic, social, environment and governance dimensions are key areas that will lead to create a sustainable path of growth for the industry. These dimensions encompass the different aspect ranging from corporate governance, environment protection, human resources, and finance. Articles covering sustainability from a holistic perspective point tend to focus on the economic, environment, and social dimensions (Goel & Sivam, 2014); on the other hand, articles focusing on analysing sustainability from the point of view of enterprise performances and transparency tent to focus on environment, social, and governance (ESG) dimensions (Kocmanova & Simberova, 2014). Taking this a foundation, this dissertation merges both perspectives
and makes an Economic, Social, Environmental, and Governance assessment based on a stakeholders perspective (Martin & Rice, 2014).

Sustainable development definitions vary depending on the author and the subject (Lele, 1991; Pearce, Markandya, and Barbier, 1989; Barbier and Markandya, 2013). In 1987, the World Commission on Environment and Development, or Brundtland Commission (WCED) defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. In addition, the United Nations (UN) stipulated sustainable development goals (SDGs) covering four dimensions of society: economic development, social inclusion, environmental sustainability, and good governance (ESEG) (UN-SDSN, 2013).

The research analyses the overall development path of the auto industry in Mexico, including the economic, social, environment, and governance dimensions, in order to understand the sustainability of the industry. By analysing these dimensions, the dissertation discusses whether the current industrial development path in Mexico is sustainable. A set of indicators that emerged from the interviews realized during fieldwork data collection is utilized to enhance the analysis. Furthermore, the thesis proposes a country strategy to continue the growth of the industry and contribute to development the industry in a sustainable manner.

The dissertation does not solely focus on the development of the auto industry, such as, higher production and sales, but rather tries to perform a comprehensive analysis by taking into consideration the sustainability dimensions. Thus, the dissertation focuses on a qualitative development rather than a quantitative development pattern.

The author proposes that emerging countries should take into consideration sustainable development theories during their development processes rather than when the industries are mature. Emerging countries have the opportunity to avoid the same mistakes made by developed countries when their auto industries were developing. This
dissertation argues that post-development costs to fight the externalities are higher than prior-development costs.

The dissertation tries to address the following research question:

- What are the prospects to develop a sustainable auto industry in Mexico?

The dissertation covers three main literature areas: Industrial development, Sustainable development and the Auto industry. The dissertation is organized as follows: Chapter Two: covers the main literature including the industrial development, the sustainable industrial development. Chapter Three: covers the structure of the global auto industry, and the characteristics of the auto industry in matured and emerging countries. Chapter Four: covers different aspects of the auto industry in Mexico, including, the development path, Mexican labour Market, a company case study, strengths, weaknesses, opportunities, and threats (SWOT) analysis and an economic, social, environment, and governance (ESEG) analysis. Chapter Five: discusses the findings and provides a set of recommendation for further discussion.

**Methodology**

This section covers the methodological framework and methods utilised in the dissertation. Research methodology encompasses the process of inquiry to generate and test theories and resolve epistemological and theoretical issues. Research methods cover the techniques and approaches to collect and analyse data (Porta & Keating, 2008); (Grix, 2010).

In order to gather appropriate data and assess the subject directly, the author studies the subject in its natural setting (naturalistic approach) leading to base the epistemology of the dissertation on an exploratory qualitative research.

The thesis is based on qualitative research collected during semi-structured interviews and second source data from government and academic publications. The author created two types questioners. One questionnaire was structured for private
companies’ officials while the other questionnaire was structured for scholars, workers, government officials and civil associations research about the auto industry.

On March 2014, the author had the opportunity to do field study in Mexico during two weeks. During this field study the author visited Mexico City and the State of Guanajuato. Three types of target audience were interviewed: automakers and parts and components supplier’s officials, university professors and academics scholars, and automotive industry associations’ staffs.

To analyse the information collected from the interviews, transcripts of the interviews were created and text analysis was utilized to identify keywords and highlights areas in each interview.

In addition, the thesis includes a short case study covering the human resource development and training strategies of a Japanese automaker (section 4.2). This case study is based on an interview to Japanese expatriate that stayed in the Mexican subsidiary during a 5 years’ period. The questionnaire created for this interview focused on understanding the human resources and training challenges of a Japanese multinational in Mexico.

Originality

The originality of the dissertation lies in the analysis of the auto industry from a macro perspective utilizing an enhanced ESG analysis method. Previous works applied the ESG analysis to rank the sustainability efforts of companies at a micro level. In contrast, this research enhances the basic ESG framework to understand the sustainability of the auto industry in the context of an emerging country (Auto Industry + Mexico + Sustainability Dimensions).
2. The Development of Industries

In economic terms, industries are related with sectors that incorporate productive activities. Service and manufacturing industries are equally important to generate economic growth in a country. Authors like Porter (1990) suggest that industries can develop thanks to endogenous factors. Nevertheless, the role that government plays to encouragement industrial development cannot be under look. The Keynesian view of the government role in the economy gradually shifted to a free market structure during the 1980s (Stiglitz, 2002). To later, become an important discussion between interventionism and free market views during the late 2000s Asian crisis and the financial crisis of 2008-2009.

Policies that encourage industrial development can be classified as policies that protect local industries from competitors and policies that encourage free competition with minimal government intervention. The first approach embraces the idea that industries develop thanks to strategic plans with systematic processes and steps. The second approach embraces the idea that industries can develop thanks to market forces and endogenous characteristics that lead to organic development.

By implementing one approach, the other approach is not automatically discarded, meaning that their implementation is not exclusive. Economic history shows that during the early stage of development many industries received support from protectionist policies. After industries reached a good competitive level, the protectionist policies tend to be eliminated.

After the Second World War international institutions emerged, encouraging a shift towards liberalization of markets, free trade, and free competition (Stiglitz, 2002; Gualerzi 2005). This stage of trade liberalization and public policies’ protectionism reduction is associated with the globalization of the world economy (Gualerzi, 2005). During this process, there were cases in which local industries opened to free competition during early stage of development, resulting into uneven competition with
more capable competitors from abroad. Which eventually led to the reduction of indigenous companies.

Due to the different development level of industries across countries, developing countries usually welcome foreign investment to support the development of local industries. However, due to previous unsuccessful examples, in some cases governments tend to be conservative in the process of welcoming foreign competitors into local industries. Nevertheless, on the other hand, successful examples show that foreign investment can be beneficial to local economy, if is well aligned with the country’s competitive advantages (Pitelis, 2009).

Despite these two approaches, governments’ main interest is to contribute to the wellbeing of its citizens. The means to contribute achieve it can vary. Nevertheless, economic empowerment is one of the main means to contribute to development. To contribute to the macro economy, international trade is important. Thus, many governments cannot avoid activities related with international trade, in the endeavour to contribute to the country and wellbeing of its citizens.

The benefits of the auto industry to the local economy lead developing countries to create national strategies to gain the resources and conditions require to develop the industry. Countries such as China and India, took advantage of their relative large markets to attract automakers from developed countries and localize the required technologies to create competitive indigenous automakers. Other countries, such as Mexico and Thailand, with smaller local markets, were not able to create the structures to facilitate the transfer of foreign automakers technologies to indigenous companies. Leading the indigenous companies to withdraw their efforts to become automakers.

The auto industry is one of the few industries that widely contribute to the development of a country. The industry’s upstream and downstream activities can positively influence many areas and industries in a country. As a result, governments in many developing countries encourage the development of local auto industries. On the positive side, the auto industry contributes to the creation of jobs, technological
development, and mobility independence. However, on the negative side, the auto industry can create environment contamination, pollution, and traffic congestion.

To balance both positive and negative effects of the auto industry, policy makers intervene by creating rules, regulations and norms with the hope of balancing the positive and negative externalities. During the beginning of the development of the auto industry, many of the negative or cost externalities were less relevant than the positive or benefit externalities. This unbalance leads to create public pressures demanding to contain negative externalities traffic congestion and pollution.

Moreover, business strategies that try to balance both environment protection and economic benefits are less common than business strategies that solely seek economic gains. Previously, more weight was placed on industrial and economic growth than on the negative externalities it created, particularly concerning the environment.

Economic gain as a unique objective, despite a protectionism or free market approach, has the potential to destroy the overall future. The increasing general awareness of the importance of a balanced country development strategy, policy makers and stakeholders in general are taking a more sustainable approach in them seek for wellbeing and industrial development.

The development of the auto industry positively contributes to related industries such as manufacturing, services, and finance. The evaluation of the sustainability level of the industry is a key metric to understand the effects of the overall development path. Furthermore, the integration of sustainability thinking in the development process of an industry with more than 100 years’ history of expertise and processes is challenging. Nevertheless, to continue the development of the industry by contributing to a future of sustainable mobility, the auto industry should develop in a sustainable manner.
2.1. Industrial Development

Many research areas focus on the significance of the word “Development”. As a result, the definition varies depending on the field. In the economics field, it is commonly described as a classic industry development model that integrates the economic and social side (O’Brien & Williams, 2010). Economic growth and technology progress tend to contribute to industrial development. However, industrial development also contributes positively to economic growth and technology progress.

Many countries benefited from industrial development strategies that contributed the national economic growth. As a result, many industries developed thanks to government support. Similarly, there are cases in which industries developed thanks to endogenous characteristics that serve as a country competitive advantage (Porter, 1990).

Since the proliferation of manufacturing industries, public policies supported the growth and expansion of industries. Policy makers tend to implement import substitution or free market policies with the expectation to develop competitive advantages versus other countries.

Import substitution policies helped to protect local industries and products from foreign imports. These types of policies were common before the General Agreement on Tariffs and Trade (GATT). The establishment of the GATT and later the World Trade Organization (WTO) led to create global commerce and free trade. Under this international environment, public policies that supported free competition and international trade emerged (Stiglitz, 1987).

Stiglitz (1987) argues that protectionism policies tend to lead to a natural development path, thanks to the intervention of government policies with the objective to substitute imports with local production. In addition, Stiglitz argues that policies that lean to global commerce and free market tend to be less interventionism.
Nevertheless, industries usually need to be nurtured during early stages of development, for instance, the case of the semiconductor industry in the United States and the auto industry in Japan, China and India.

The case of the Japanese industrial development after the Second World War is a success example of government support and collaboration with the private sector. Thanks to this key collaboration, Japan developed competitive advantages in key industries such as autos. The government main objective was to create the correct level of synergy and macro environment to develop industries that could compete with companies from developed countries (Pitelis, 2009).

The case of the Chinese industrial development is another success example. The protectionism and free market approaches worked together to provide China with the adequate industrial infrastructure to compete internationally. China implemented successfully a hybrid model by combining import substitution policies and export-oriented policies. A downside of this hybrid model is the lack of inclusion of different stakeholders in the policymaking process and strategy development.

2.1.1. Protectionism Policies

Public policies that protect local businesses and industries from foreign competition were common before the establishment of the GATT and the WTO. Import substitution policies were common to protect local companies and industries from foreign competition and imports. Thanks to these policies, locally manufactured products replace import products. Previously, tariff and import barriers excluded imported products from local markets. Import substitution policies helped developing countries to disperse previous world division of labour (Baer, 1972). Furthermore, it helped to establish local manufacturing activities, increase employment, and develop industries.

Developing countries in East Europe, Asia and Latin America, implemented protectionism policies as well. Latin America implemented many import substitution policies during the 1950s and 1960s (Baer, 1972) showcasing examples were
protectionism policies did not help as intended, especially, the case of Brazil, Argentina and Mexico (Baranson, 1969; Baer, 1972). For instance, Baranson (1969) shows how automobile’s factories in Brazil and Mexico had 60 per cent to 150 per cent higher cost than in the United States. The case of the auto industry in Malaysia also reflects an unsuccessful example of protectionism policies by the lack of international competitive advantages and dependence on foreign, mainly Japanese, technology and expertise (Segawa, Natsuda, & Thoburn, 2014).

2.1.2. Free Market Policies

Free market policies support competition among local and foreign companies. These policies usually allow flows of foreign investment enter local markets and industries. International political economy history shows that free market policies emerged after the elimination of protectionism policies with the help of the WTO. Free market policies encouraged the elimination of tariff barriers and other barriers that discouraged competition. Nevertheless, non-tariff barriers emerged to protection to local business and industries. Due to their soft characteristics, non-tariff barriers are vague and more difficult to identify in comparison with tariff barriers.

David Ricardo’s comparative advantage suggests that countries should concentrate on industries that can compete internationally, which can contribute to the overall development of the country by increasing the possibility for trade with other countries (Ricardo and Hartwell, 1971).

Pitelis (2009) argues that a market based on competition is the source of innovation, as supported by the theory of “systems of innovations. The theory’s downside is that requires a complete system working efficiently. The system includes government policies, markets, and institutions that promote innovation.

In addition, the diamond model from Michel Porter (1990) assesses the competitive advantages of nations in certain industries based on four elements. In order to take complete advantage of this model, countries base their industrial policies in free markets and competition.
The diamond model is Porter’s method to determine national competitive advantages. The diamond model utilizes four determinants that influence directly the competitive landscape for local and foreign companies. These determinants promote or restring competitive advantages in a country or group of countries that could lead to develop industries. The four diamond model determinants are factor conditions, demand conditions, related and supporting industries and firm strategy, structure and rivalry. In addition, the chance and government exogenous factors have the potential to influence the four main determinants. Every determinant has the potential to influence in the international competitive success of countries in the industries they decide to compete.

By utilizing this model, Porter argues that countries’ productivity levels are important factors to achieve competitiveness at national level. Furthermore, he argues that the productivity level of a country’s labour force and capital investment have the potential to contribute to generate high standards of living. Porter defines productivity as the value of the output produced by a unit of labour or capital. In addition, he suggests that country’s capabilities should be constantly improving in order to sustain productivity growth.

Porter covers the relation of clusters with the determinants of national advantages in 1998. Clusters are companies and institutions that are connected and with relative geographical proximity. These connections can be across companies in different industries and sizes. Clusters have the potential to improve productivity, innovation, human resources development, flow of information, and creation of new companies. Clusters competitive advantages can also be analysed using the diamond model.

To complement Porter’s diamond analysis, other methods emerged. For instance, Rugman (1992) presented the double diamond model. Rugman argues that Porter’s single diamond model is suitable to analyse the competitiveness of large countries, but is not effective when analysing smaller countries. Rugman bases his argument demonstrating that a single diamond analysis does not capture the smaller countries’ connections with foreign diamonds. The global structure of the auto industry is an
example of this argument when observing the connection of countries’ local manufacturing with the supply chain network across countries.

In addition, Cho and Moon (2000) developed the nine-factor model reinforcing the weakness of Porter’s diamond model when analysing developing countries. Cho and Moon’s nice-factor model includes human factors to explain a nation’s competitiveness. In addition, their model includes natural resources under endowed resources, while labour belongs within the category of workers (Cho & Moon, 2000; Cho, et al., 2009). While Porter’s diamond includes both natural and labour resources inside the factor conditions.
2.2. Sustainable Development

This section covers the literature related with sustainable development, sustainability and the different dimensions of sustainability. The literature covering the concept of sustainability is vast. The concept is applied across all areas of social sciences including: economics, management, etc. Sustainable development has different meanings depending on the subject it is applied to, such as: ecologists, economists, planners and politicians.

Hanz Carl von Carlowitz, a German forester, first used the word “sustainability” in his book “Sylvicultura Oeconomica” in 1712. In this book, he covers how forest could be handled on a long run basis (Turcu, 2013) (“Managing product returns to achieve supply chain sustainability: an exploratory study and research propositions,” 2015).

In 1987 the World Commission on Environment and Development, or Brundtland Commission (WCED), defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The report defined “needs” as the essential needs particularly of the world’s poor population, and “development” is defined as the progressive transformation of the economy and society.

The definition by the WCED does not completely fit the objective of this thesis, which assesses the development path of an industry rather than a complete society. Nevertheless, it provides an important starting point.

Sustainable development definitions vary depending on the author and the subject (Lele, 1991; Pearce, Markandya, and Barbier, 1989; Barbier and Markandya, 2013), and that is a common occurrence in the social sciences. Additionally, sustainable development is associated with ecologically, and environmental sustainable development (Lele, 1991).
Lele (1991) defines development as a process of socio-economic change. However, Lele argues that this definition should be accompanied with the objectives the process of change and the means to achieve those objectives. Lele (1991) explains the wrong interpretation of sustainable development, and how development is mistakenly related with economic, consumption, or production growth.

In a broader social scope, the United Nations (UN) has stipulated sustainable development goals (SDGs) during Rio+20 meetings. These SDGs are covering four dimensions of society: economic development, social inclusion, environmental sustainability, and good governance (ESEG) (UN-SDSN, 2013).

In another area of the social sciences, a common trend presents sustainability analyses of corporate responsibility and business investments. These analyses include the dimensions of Environment, Social, and Governance (ESG) (Hacking & Guthrie, 2007; Kocmanova & Simberova, 2014; Pope, Annandale, & Morrison-Saunders, 2004). On the other hand, other studies cover sustainability assessment from the point of view of society in general. These studies include only the Economic Society and Environment dimensions (Hopwood, Mellor, & O'Brien, 2005; Martin & Rice, 2014).

Furthermore, Ness et al. (2007) proposed a framework to classify the different approaches of sustainability assessment tools. This framework devises the different approaches based on object of focus of the tool, such as retrospective (indicators/indices) or prospective (integrated assessment)(Ness, Urbel-Piirsalu, Anderberg, & Olsson, 2007).

Pearce et al. (1989) argue that the WCED definition of sustainable development appeals to economists because of its capital approach thinking. Their book, *Blueprint for a green economy*, suggests that sustainable development is not only about the aggregate stock of capital to meet current and future generation, but also about its composition. Thus, they present a portfolio of assets that prevents welfare reduction over time. This portfolio includes Natural, Physical, and Human capital. Furthermore,
they add that weak natural capital compromises physical and human capital, thus affecting overall sustainable development.

To achieve sustainable development, Pearce et al. (1989) propose first, that environment valuation is integrated into economic development policies and strategies. Second, they propose effective policies controlling excessive environmental degradation. Third, they propose collaboration between environmental scientists and economists.

A definition that is in line with the topic of this thesis is presented in the area of political economy by O’brien & Williams book (2010) who argue that sustainable development should not be related with consumption and production growth but with improved quality of life in which the natural environment is taken into consideration.

There are a large number of studies covering the topic of sustainable development at company level, but on the other hand the studies covering the of sustainable development at industrial and national level is limited (Jullien, 2013).

In conclusion, the addition of the sustainable theory dimensions to the development theories creates a new model that includes the participation of all stakeholders. The stakeholders of the auto industry include public policy makers, auto manufactures, parts and components suppliers, employees, and the users.

The following section examines the components of the ESEG dimensions of sustainability that most influence the auto industrial development in Latin America.

2.2.1. Dimensions of Sustainability

To analyse a company just by its economic results is not enough to understand whether the company can sustain its current performance, and whether it can be affected by non-financial factors. For this reason ESG indicators are commonly included to assess companies’ strategies related with sustainability, long run risks and opportunities
Similarly, this principle should be applied to understand the sustainability of the overall industry in a macro level.

To assess the overall sustainability of the industry, the economic (e) dimension was added to the ESG framework. This addition creates the economic, social, environmental, and governance (ESEG) indicators as an expansion of the basic ESG indicators. This is in line with the United Nations’ sustainable development goals (SDGs) covering four dimensions of society: economic development, social inclusion, environmental sustainability, and good governance (ESEG) (UN-SDSN, 2013).

Articles covering sustainability in from a holistic perspective point tend to focus on the economic, environment, and social dimensions (Goel & Sivam, 2014), on the other hand, articles focusing on analysing sustainability from the point of view of enterprise performances and transparency tent to focus on environment, social, and governance (ESG) dimensions (Kocmanova & Simberova, 2014). Taking this as a foundation, this dissertation merges both perspectives and make an Economic, Social, Environmental, and Governance assessment based on a stakeholders perspective (Martin & Rice, 2014).

Figure #1: Dimensions of Sustainability
(By own elaboration based on the literature review)
The “Triple Bottom Line” viewpoint from the book “Cannibals with Forks” by John Elkington (1997) argues that non-financial indicators should also be taken in consideration when analysing companies’ performance. The “Triple Bottom Line” helped to accelerate and encourage investors in late 1990s, to include ESG and non-financial measurements in their analysis reports. Later scholars agreed that each viewpoint enhances the other, and both should be taken in consideration (Barnett and Salomon 2006).

Nowadays is common that financial investors assess environmental, social, and governance (ESG) indicators to analyse companies’ future financial results under predetermined risks scenarios. ESG analysis tends to not focus on economic performance but rather helps to predict the future cash flows of a company as well as its long run performance (Kocmanova, Karpíšek, & Klímková, 2012).

Furthermore, ESG key indicators help to understand corporate strategy performance and business sustainability. ESG key indicators also could provide quantitative and qualitative feedback of the company (Kocmanova et al., 2012).

Turcu (2013) argues that mix of sustainability indicators should include the viewpoints from experts and government (top-down) as well as the viewpoints from local perspective (bottom-up). Turcu’s finding suggests that is more complex to implement local perspective into the sustainability indicators than the perspective from experts and governments. Turcu concludes that sustainability indicators should not be “definite” but rather be flexible, thus the indicators should adapt to different set of priorities and needs (Turcu, 2013).

Despite the clear objectives of ESG analysis, due to the broad utilization of ESG indicators there is lack of standardization among the indices used by ESG rating agencies (Escrig-Olmedo, Munoz-Torres, & Fernandez-Izquierdo, 2010).

Furthermore, the ESG indicators utilized by financial investors cannot be identically applied to analyse an overall industry performance. For instance, because the overall
ESG analysis assesses economic performance, the economic (E) dimension is not included. Thus, to analyse the sustainability development path of a complete industry the economic dimension should be added. In addition, the ESG key indicators in combination with UN Sustainable Development Goals (SDG) dimensions provide a more comprehensive analytical tool to assess the sustainability path of the auto industry in Mexico. The economic, social, environmental and governance’s sustainability indicators serve as the foundation to understand in a broad sense all the aspects of the auto industry.
3. The Auto Industry

The auto industry encompasses activities related with manufacturing, designing, marketing, and selling cars, trucks and motorcycles. The first automobiles were manufactured in the 1890s utilizing different techniques (Ingrassia, 2012). The auto industry has become one of the key industries that through history helped to create economic growth and bring modernization to countries (Shapiro, 1991).

Manufacturing industries in general, including the auto industry, are well known for their labour intense activities and for being an important source of jobs. However, due to the advancement of technology and manufacturing methods, the number of blue-collar jobs has been decline while the number of high skilled jobs has been growing.

Automobiles have influenced the life of people around the world in many different areas. The mobility freedom is just part of automobiles attraction. The expansion of the auto industry is noticeable in the way people commute. The proliferation of the automobile affected heavily cities around the world. The automobile affected areas related with city infrastructure, city design, urban planning, and wider interconnection between cities. Automobiles enlarged significantly the job opportunities in many industries.

Since its introduction, the automobile was designed to contribute to the mobility of people. However, many cities have reached overcapacity, and it became a cause of congestion. The auto industry’s growth is also affecting cities’ ecosystems and the overall environment. Cities in developed countries, such as the UK, are implementing restrictions to vehicles with high contamination rates and imposing tax breaks to cars equipped with “green” technologies, such as hybrids and electric vehicles.

The following auto industry’s characteristics have shaped its structure and organization: the high capital investment required to compete internationally and the close relation between vehicle manufacturers and suppliers, which is the increasing outsourcing of value chain activities from manufacturers to suppliers.
Among the distinctive characteristics of the auto industry are (1) the firm concentrated structure, (2) vehicle assembly proximity to end markets, (3) regional structure and (4) few generic parts (Sturgeon, 2009).

(1) The structure of firm concentration is reflected by the fact that the main international competitors have origin in the United States, Europe and Japan, which are also called TRIAD (Jullien & Pardi, 2013). (2) The vehicle assembly proximity is reflected by the growing number of auto industries being develop in emerging countries with foreign direct investment from established manufacturers from developed countries and political pressures or incentives. (3) The regional structure is reflected in the unique set of rules and regulations that drive the local automobile characteristics such as engine, weight, and safety. (4) The low number of generic parts can be observed model or segment specific features and low number of modularisation in the production processes (Sturgeon, 2009).

Despite these major distinctive characteristics there are important on-going structuration process in emerging markets and a restructuration process in matured markets (Alvarez-Medina & Carrillo, 2014; Jullien & Pardi, 2013).

Since 1975, global automobile production has doubled its output capacity (Sturgeon, 2009). More recently, despite the economic crisis in 2009, the global automobile production increased by more than 25 million units in the last decade (OICA, 2014). The increase in the last decade has been heavily supported by the growth in emerging markets such as China, India, Brazil and Mexico.
This chapter covers the main characteristics of the global auto industry, the auto industry in matured and emerging countries. The objective of this chapter is to understand the uniqueness characterises of the industry and explore the development routes of different auto industries. This exercise is a baseline exercise to explore the auto industry in Mexico.

This chapter examines the auto industry in six countries. These auto industries were selected due to their relevance in the global auto industry and / or due to their similarities to the auto industry in Mexico. Three mature and three emerging auto industries were selected. The three matured auto industries selected are in the United States, Germany and Japan. The three emerging auto industries selected are in China, Thailand and Brazil.

The three matured auto industries selected are important to understand the development process of these countries and the current structure of their industries. For instance, the roots of the current auto industry started in Germany and the United States. In the case of Japan, important learning lessons can be observed in the close relation between the public policies and the private companies. In addition, since the United
States’ market is the main receiver of autos manufactured in Mexico, understanding the market structure is helpful to assess Mexico’s overall strategy.

The three emerging auto industries selected developed their auto industries during similar period and development stages from the point of view of public policies and economic development. Despite this similarity, there are important differences and current development stages. For instance, in the case of China foreign investment is by automakers and parts and components suppliers are restricted only to Joint-Ventures activities. In the case of Thailand, the country strategy is based on attracting foreign investment to increase manufacturing capabilities in green technologies and develop the local supply chain. Brazil is in the opposite side of Mexico’s foreign investment attraction. Brazil’s main strategy is to develop capabilities targeted for the local market, such as flex-fuel engines.
3.1. Trends of Global Auto Industry

The auto industry is experiencing interesting set of changes that are shaping its current structure, and have the potential to change the current status. There are signs that the traditional development models have reached their limit. For instance, it is no longer certain that the automobile industry can create the same amount of jobs as before. Nevertheless, new technological advances are paving the way for more high skilled workers.

The global auto industry is going through a process of important changes; changes that can shift the competitiveness of established players and increase the opportunities for new players. For instance, in the late 1990s many automakers had the idea that mega mergers and alliances were they only way to reach the production economy of scale to compete globally and be profitable (Shimokawa, 2010). That belief was tested on the works by the Gerpisa international network that focused on the productive models of different players of the industry and understanding the under which conditions firms in the industry can survive (Boyer et al., 1998; Carrillo, Lung, & Tulder, 2004). Productive models is described as analytical tools that permit to develop a balanced analysis of companies (Jullien & Pardi, 2013).

Sturgeon et al. (2009) present four main trends that the auto industry experimented in recent years. First, it is discussed about the growth of vehicle production in the 1990s and 2000s due to the opening of emerging markets such as China and India. Second, despite the increasing relevance of emerging markets, the matured cored markets, such as the United States, Europe and Japan, remain having strong importance. Many value chain activities related with R&D and design remains in these matured cored markets. Third, thanks to the globalization, the auto industry moved to agglomerate automakers and suppliers’ operations based of regional geography locations, regions such as North America, South America, Europe, Southern Africa, and Asia. Fourth, the elements that define national and local structures, such as consumer tastes, purchasing power, driving conditions, labour markets regulations, standard requirements, and public policies (Sturgeon et al., 2009).
Jullien and Pardi (2013) suggest two trends in the auto industry. The first trend is referred as the transformation process of productive organizations by changing its national context or leaving the domestic market of the company. This trend is evident in cases in which the automaker is established in matured markets with low growths and market penetration. The second trend is referred as the link between the productive organizations and the conditions under their deployment. This trend referrers to the productive models changes in developed countries and emerging countries (Jullien & Pardi, 2013). This trend was evident during the 2008-2009 financial crisis that affected most of the matured markets and the growth that many emerging markets had during the same period (Alvarez-Medina & Carrillo, 2014).

In the following pages presents in more details three trends that are shaping the competitive landscape of the global auto industry. First the introduction of new technologies is presented. Second, new players are introduced. And third, the growing importance of emerging markets is assessed. These three trends have the potential to cause a fundamental paradigm shift of the worldwide auto industry.

3.1.1. New Technologies

The global auto industry is going through a process of important technological changes. Auto industry stakeholders are creating new competitive advantages with the help of new technologies such as: new powertrains (electric engines and fuel cells), low weight materials (aluminium and carbon fibre), and integration of drive aid software (self-driving cars and vehicle-to-vehicle communications).

Moreover, new powertrains technologies are being developed without a clear understanding on which one will be the future dominant. The two technologies that automakers are majorly investing in are electric engines, including hybrids powertrains, and fuel cells.

The largest automakers investing in electric powertrains are Tesla and Nissan, while other Japanese automakers are heavily investing in fuel cell technologies.
Currently, battery range limitation is the most important challenge to overcome in regards to this investment. The largest automakers investing in fuel cells powertrains are Toyota and Honda. In the short time, the hydrogen-refuelling infrastructure is the first challenge this technology must overcome.

In addition, low weight materials are being introduced in the mass consumer side of the auto industry as a strategy to reduce weight and improve fuel consumption. Many automakers having included high strength steel in their automobiles for many years, but now they are including aluminium and carbon fibre to gain more weight savings.

The main challenges of these two materials are the cost and integration to the current production processes. Carbon fibre can cause a double increase in the production cost and increase the production times. Aluminium is relatively less expensive and can be mass-produced similar to the way steel is produced. Automakers, such as BMW, have built new factories in order to create new production process and methods to include these technological advantages.

Furthermore, driver aid software has emerged as a new integration between computer science and the auto industry. Technological advancements in software and sensors are leading the way for automakers to include and create technologies to help improve the driving experience for customers.

Automakers such as Nissan and Mercedes Benz are heavily investing in technologies such as driver assist, with an ultimate goal of having a completely self-driven car that is able to communicate with other vehicles of similar technology.

Companies such as Google are seeing these technological advancements as opportunities to enter the industry with their own products. Similarly, these technologies are reducing the entry barriers for new players, especially in emerging countries such as Mexico, China and India.
3.1.2. New Players

New players have emerged as a result of the previous technological changes mentioned above and the policies to support new local companies entering the auto industry in emerging countries such as China and India (Altenburg, Bhasin, & Fischer, 2012). Furthermore, these changes are helping new comers to increase rapidly their competitive advantages. Tesla is an interesting example of a company that entered the auto industry with a new approach to powertrains, thus creating an asymmetric competition field between Tesla and the incumbent companies.

In the cases of players in emerging markets, new players have the chance to take advantage of new technology lower implementation costs to compete at the same level of established companies. Furthermore, new players have the opportunity to compete with established automakers by leapfrogging in the development of new technologies such as electric engines (Wang and Kimble, 2011). The new technology lowers implementation cost and refers to the cost that automakers need to pay to implement these new technologies into their processes and operations. For incumbent automakers with current technology, they need to go through replacement costs and process changes that new players do not have to face. A way to overcome this is for incumbent players to set up new production facilities to implement and test the new technologies, rather than implementing them into their existing facilities.

The case of the new automakers that emerged in China presents an interesting example of this trend. As statistics from OICA (2014) shows that China is the largest automobile market and producer. Fuelling this growth is the increasing number of joint ventures between multinational companies and domestic newcomers. One of these examples is the case of the Chinese automaker Geely (Wang, 2009). Geely just started to manufacture in 1998, but it is already one of the leading companies in the local industry.

Another example is the case BYD and batteries technologies. BYD was founded in 1995 as rechargeable batteries manufacture but in 2003, it created its automobile
division to manufacture automobiles using its own batteries. Since BYD’s beginning, BYD has been perceived as potential disruptor and as important player that will help the Chinese auto industry gain international competitiveness. Even American investors have buy stakes in the company, with the expectations of becoming a key manufacturer of electric vehicles batteries.

Due to the high growth of the Chinese and Indian auto market, Indian and Chinese companies have developed to the point of reaching international markets and making acquisitions of matured companies from developed world. Chinese and Indian companies have buying foreign companies with the hope of gaining access to technology and managerial expertise. For instance, the case of Geely purchasing Volvo, Tata buying Jaguar-Land Rover, SAIC buying Rover, and the Wanxiang group buying the American battery maker A123 systems.

3.1.3. Emerging Markets

China and India can be considered as the best examples of emerging markets. These countries have been forecasted to become the largest markets in the near future (Ban, Belzowski, & Gumbrich, 2006). Therefore, the most important multinational companies have been expanding their operations in these emerging markets.

The rise of China and India indicates the shift from mature markets, such as the United States, Europe and Japan, to emerging markets. The rapid growth and increasing sophistication of the markets has led to the development of a “complete” local auto industry in China and India. This “complete” auto industry starts from a competitive manufacturing platform for existing models, and builds up an increasing capability in developing and designing new vehicles. At the same time, China and India are developing competitive parts and components industries, so that they could play significant roles in the global value chain of the auto industry.

In Latin America, the auto industry is not as advanced as the auto industries in China and India. Nevertheless, in 2011, Brazil became the fourth largest automobile market in the world (3.6 million) and its production capacity grew to become the sixth
largest manufacturer in the world (3.4 million) (OICA, 2014). Regardless of this progress, the industry has not reached the same level as China and India. For instance, the Brazilian indigenous firms are still weak. However, it could be assumed that as China and India are developing their auto industries, Brazil could also increase its current capabilities and play a much more important role in the global auto industry in the future.

Moreover, the auto industry in Mexico is also expanding, thus the potential of the Latin American region is growing as well. An increasing number of multinational companies are making more investments into the auto industry in Latin America, in Brazil and Mexico. The first investments were made in Brazil and Mexico, before proceeding into other Latin American countries’ auto industries. Multinational companies not only increase their production capabilities but also they transfer production processes, knowledge and technology to indigenous firms.

Chart #2: Automobiles Production in China, Thailand and Brazil
Chart #3: Automobiles Production in the United States, Germany and Japan

Automobile Production in
The United States, Germany and Japan

Source: OICA

USA
Japan
Germany

13,024,978
9,774,558
5,907,548


4,000,000 6,000,000 8,000,000 10,000,000 12,000,000 14,000,000
3.2. Matured Auto Industries

The overall structure and the development pattern of the auto industry in the United States, Germany and Japan are presented in this section. These countries gained international competitiveness in early stages of the auto industries.

3.2.1. The United States

The auto industry in the United States can be traced from the 1890s and its biggest companies, General Motors, Ford and Chrysler, have dominated the auto industry since the 1930s. The United States has been one of the largest markets and hubs for technological innovation. For example, Ford created the mass manufacturing processes in 1913.

The auto industry in the United States was predominantly located in the state of Michigan. As the auto industry expanded many production facilities were established in other states. Especially, most of the foreign automakers decided to establish their main operations outside the state of Michigan. Among other reasons, foreign automakers wanted to avoid the labour issues that other automakers faced in Michigan (Womack et al., 1990; Ingrassia, 2010). Nevertheless, the state of Michigan remains as an important human resources hub with relevant technical capabilities especially in high added value activities.

Womack et al. (1990) showed in their research results how the American automakers were uncompetitive against the Japanese automakers. The results reflected the gap in productivity, cost, lead times, etc. After these revelations, the American automakers have improved greatly, and the gap with foreign automakers is not as large as in the past.

The United States market remains the second largest market after China’s market. In terms of production, it is also the second largest country, after China. In 2013, more than 11 million cars were produced in the United States. The market already shows signs of recovery from the deep crisis it faced in 2008-2009. During this crisis, all
automakers reported significant sales and production reductions. General Motors and Chrysler went through bankruptcy and corporate restructuration. On the positive side, the crisis helped automakers to become more lean companies (Ingrassia, 2010; Rattner, 2011). The results can be observed in the automobile production after 2009.

Chart #4: Automobiles Production in the United States

The United States is considered a matured market due to its long history and stage of development. Its Infrastructure is one of the most advanced in the world (Ingrassia, 2010). The auto industry in the United States and Mexico works as a double diamond. Utilizing Michel Porter’s diamond theory to explain the competitiveness of countries in an industry, the United States and Mexican diamonds are interconnected, helping one another in their respective weak areas (Perez Debrand, 2012).

3.2.2. Germany

Similar to that of the United States, the auto industry in Germany can be traced back to the 1980s. Currently, its largest companies are Volkswagen, followed by Daimler Mercedes, BMW and Opel. These companies have successfully expanded globally and as a result, their auto industry is the largest industry in Germany (GTAI, 2012).

During the auto mobility efforts before the war, an affordable and durable automobile was planned and designed. The goal was to provide affordable private
transportation to the masses. Germany officials wanted to replicate the same success the Ford Model T had in the United States (Ingrassia, 2012). Despite this desire, the automobile was not built because the auto industry almost entirely shifted to manufacture cars during the Second World War. It was after the war in 1945 that this automobile was built by VW, and named Beetle.

After the war, the German auto industry went true a process of restructuration and companies such as BMW started to produce automobiles successfully. During the next three decades, the industry grew and went to some financial crises that created merges and acquisitions. During the 1990s, many German automakers performed various international acquisitions, among others, BMW’s acquisitions of UK’s Rover and Mini and VW’s acquisitions of Bentley and Lamborghini. Daimler opted to do a joint venture with US’s Chrysler. Years later BMW sold Rover to a Chinese automaker and Daimler separated from Chrysler to an American private equity firm.

Germany was also affected by the global financial crisis of 2008-2009. In 2009, production dropped 14 per cent, but by 2011, it recovered with a growth of seven per cent. 2012 and 2013 have production have been affected by the second overall European recession and relocation of production outside Germany (OICA, 2014).

Chart #5: Automobiles Production in Germany

![Automobile Production in Germany](chart.png)

Source: OICA

5,907,548
3.2.3. Japan

The auto industry in Japan is one of the main industries in the country. In 2012 the auto industry accounted for 17.4 per cent of Japan’s manufacturing shipments (JAMA, 2014).

The auto industry in Japan had a remarkable reborn after world war two. During this period, the Japanese government prohibited FDI, to protect the 12 emerging
automakers and growing auto industry. In early 1950s, the Japanese Ministry of International Trade and Industry (MITI) encouraged the 12 automakers to merge into two or three big companies, and that way gain international competitiveness by creating high production scale. This plan did not succeed, and the automakers defied MITI to grow to become full-range automakers (Womack, 1990).

Pitelis (2009) argues that the auto industry in Japan was able to create industrial competitiveness after the Second World War thanks to the close collaboration of the government with the private sector. Pitelis further argues that Japan used limited FDI to improve their capabilities in these early stages of development and to steer the overall industry in the direction that the government and private sector desired.

Currently, the largest automakers in Japan are, Toyota, Nissan, Suzuki, Honda, Mazda, Daihatsu, Fuji Heavy Industries (Subaru), and Mitsubishi. Toyota is the largest automaker in the country; in 2013, it produced 3.3 million autos in Japan.

Japanese automakers, and overall industry, are well known for its production efficiency and highly integrated production systems (Shimokawa, 2010; Fujimoto, 2007). In 1990 Womack et al. showed how lean production; pioneered by Toyota, was superior to the conventional production system implemented by non-Japanese automakers.

The Japanese automobile market is one of the largest in the world. In 2013, 4.5 million new passenger cars were sold. 8.1 million Passenger cars were produced and four million passenger cars were exported in 2013 (JAMA, 2014).

In Japan, there is a unique category of passenger automobiles call Kei-cars. In 2013 were produced and sold 1.6 million Kei-cars in Japan. In terms of physical size, the law strictly defines Kei-cars: 1.48m maximum wide and 3.4m maximum long and maximum engine capacity of 660CC (JAMA (b), 2014). As seen in the charts below, production is almost split evenly between local sales and exports, in contrast with the 80 per cent of production that is exported from Mexico.
The case of the Japanese automakers is a positive example of good relation between government and private sector. Between these two stakeholders, the overall auto industry has been able to develop to become one of the most important in the world. Currently, Japanese automakers are operating in all regions of the planet. Latin America is one of the most promising growth areas, thus Honda, Toyota, Nissan and Mazda have increased their investment in the region.

Chart #8: Automobiles Production in Japan

![Automobile Production in Japan Chart](chart)

Chart #9: Automobiles Exports from Japan

![Automobile Exports from Japan Chart](chart)
Chart #10: Automobiles Sales in Japan

Source: Jama
3.3. Emerging Auto Industries

The overall structure and the development pattern of the auto industry in China, Thailand and Brazil are covered in this section. These countries gained international competitiveness in recent stages of the auto industries.

It can be determined from the history of emerging markets commonalities among their development pattern. These auto industries were protected from foreign competition in the early stage development. Later, the industrial policies changed to accept foreign imports and competition after the national auto industries had a good level of competitiveness. The only exception is the case of the auto industry in China, because it retains some types of protectionism policies.

3.3.1. China

The growth path of China in the last decades is encouraging. China’s local auto market is the largest in the world (OICA, 2014). This growth can be observed in the production, sales, and infrastructure investment, such as roads, ports. City governments have been also investing in transportation infrastructure, leading to sustain the growth of the cities and public transportation.

China’s auto industry has received record amount of FDI from automakers and parts and components suppliers with the plan to grasp a share of the growing automobile market. The policies implemented tended and continue to be strategically directed and policed by the government (Gereffi, 2009). Gereffi further suggests that while both countries have relied on FDI to develop the local auto industry, the macroeconomic conditions and government role in shaping the industry, were the important factors to shape both industries. Mexico shifted to liberalize and play a softer role development of the industry, while China remains active shaping the industry’s development.

Gao (2006) suggests the following key characteristics for the Chinese development model: market as a driver of economic growth, government attracts FDI,
open market for foreign investment, low labour cost advantages, soft government supervision, emphasis on economic growth and upgrading over social stability.

Government policies helped to encourage the development of Joint ventures within indigenous firms and multinational companies. This government policy is helping to increase the competitiveness levels of the indigenous firms. Nevertheless, foreign brands dominate the market, with more than 50 per cent market share.

In 2013, vehicle production reached more than 22 million. Production capacity in China has been growing steadily for more than a decade. This growth is due to the large amount of FDI and local investment by automakers and parts and components suppliers.

There is evidence of the spillovers and technology transfer success, partly thanks to the policies implemented by the government to create partnerships and joint ventures while encouraging new technologies development. For instance, technology transfers in China are contributing to the advancement of green technology locally (R. Lema & Lema, 2012).

Chart #11: Automobiles Production in China
3.3.2. Thailand

The case of Thailand could be categorised as late starter. Thailand has a viable auto industry that serves as hub for the South Asian region. Thai automobile production is growing, particularly thanks to FDI, and is producing good amount of jobs. However, it has created some externalities, and it has not been successful encouraging their indigenous companies.

There is an increasing amount of literature in the case of emerging Thai multinational companies. However, in the auto industry indigenous flourishing remains limited.

Import Substitution

In 1961 the joint venture between Ford of Britain and the Thai Motor Industry Corporation was established, making the first step of the auto industry in Thailand. In 1969, the ministry of Industry (MOI) created a special committee to formulate a master plan to develop the automobile industry.

Later on, the Thai government implemented incentives for companies established in the country and trade barriers to protect the domestic producers during the 1970s and
1980s. An example of the trade barriers was local content requirements. Nonetheless, the protectionism policies also helped foreign companies and helped to attract further foreign investment. As a result, Japanese makers developed a strong local supplier network that supported intra-firms’ collaboration. During this period, most of automakers were joint ventures between local and foreign companies. Afterward, the local currency devaluation in 1997 affected the overall manufacturing sector seriously, and production capacity decreased.

**Liberalization**

During the 1990s, the auto industry started to be liberalized thanks to government change in public policy strategy. Leading to the elimination of protection policies in 1994. As a result of the elimination of the protectionism policies, Japanese, European and American companies increased investment in the country.

Later on, in 2000, local content requirements (LCR) were completely abolished. Natsuda and Thoburn (2014) argue that the government in Thailand implemented specific public policies with the objective of developing capabilities and knowhow on certain vehicles types and manufacturing functions.

Suehiro (2009) argue that the time that the protectionism policies were eliminated seems to be the appropriate to take advantage of the slow reaction of the neighbour countries such as Malaysia, Indonesia, and Philippines, to implement a change from protectionism policies. Furthermore, Suehiro argues that other elements contributed to the development of the auto industry in Thailand after the elimination of import substitution policies. These elements are liberalization of the economy, parts and component suppliers’ agglomeration, and the regional strategy of foreign companies.

**National strategy**

The government in Thailand in partnership with private institutions developed a national plan during the years 2000s, to encourage foreign investment on areas that could help the country develop specific competitive advantages in green technologies.
Various plans have been already developed, and they were named: “Thailand Automotive Industry Master Plans”. The plans have expanded during the years and at the moment encompass three phases: 2002-2006, 2007-2011, and 2012-2016.

The 2012-2016 master plan includes the details of the “vision towards 2021” including the goal of developing Thailand as green technology production hub that includes a growing number of indigenous parts and components suppliers.

After the creation of these master plans, the auto industry in Thailand has been developing successfully thanks to the inflow of foreign investment. In 2013, Local production of vehicles reached 2.5 million units. Nevertheless, since 2014 the local market and manufacturing activities were affected by macroeconomic and political instability.

Chart #13: Automobiles Production in Thailand
3.3.3. Latin American

The auto industry in Latin America is one of the main industries and has been enjoying important growth in countries such as Mexico, Brazil, and Argentina. Furthermore, new Korean and Chinese automakers have indicated their interest in expanding and opening new operations in Latin American countries. Based on their development path, many countries in Latin America implemented similar public policies to develop their auto industries. Public policies such as import substitution to protect and incentivize local vehicle production. These policies, tended to be followed by period of policies relaxation but local content requirements still present. After this period of soft liberalization, most of the trade barriers were eliminated, and bilateral and regional trade agreements started to be establish (Ciravegna, 2003; Barragan, 2005;
Quadros, 2009; Ubigui, 2010). During period of public policies evolution, foreign companies already had operations in the main markets, Brazil and Mexico, and they tended to have the largest market shares. Since the 1920s foreign companies started to play an important role in the development of the auto industry in the region.

During the last decade the auto industry in Latin America has been growing and developing remarkably. Nevertheless, in the last two years’ markets such as Argentina, Brazil and Venezuela have been slowing down due to macro economic and political reasons. During the same period, Mexico has not slow down and has been attracting more foreign investment and expanding the local production capabilities. Before this recent down term, the auto industry in most countries was growing rapidly thanks to access to credit, economic stability, and low interest rates increased consumer confidence.

In general, the auto industries in Argentina, Brazil, and Mexico are the most advance, have the largest production capacity and advanced capabilities. (Consini and Quadros (2006) argue that Brazil current progress has been thanks to the localization of research and development activities together with the utilization of global platforms to engineer new products for local needs. In addition, Covarrubias (2011) argues that Mexico has benefited of relatively lower cost and strong suppliers network. These advancements help to increase the competitive advantage of the region and help to attract further investments.

Investments can benefit from the size of the Brazilian market. For instance, since 2010, Brazil is the fourth largest vehicle market in the world, with 3.5 million vehicles (ANFAVEA, 2014). Furthermore, in 2010 Brazil also became the sixth largest vehicle manufacturer in the world, reaching a production of 3.6 million vehicles (OICA, 2014).

On the downside, during 2014, local productions and sales in Brazil have not been growing due to macro economic conditions. Production volumes decreased from 3.7 million in 2013 to 3.1 million in 2014 (OICA, 2014). Sales volumes decreased from 3.7 million in 2013 to 3.5 million in 2014 (ANFAVEA, 2014).
Latin American countries can benefit extensively from the growth of the auto industry in the region. Since most of the auto related activities in the region started thanks to foreign investment, local communities can benefit from the increasing job and training opportunities. Foreign companies have the chance to increase the overall productivity of the region by transferring their production capabilities, technological expertise and production management experience.

On the topic of regional trades, Brazil, Argentina, and Venezuela belong to the MERCOSUR trade block. As a result, auto industry related products could be trade in the region easily. Mexico also is benefited by thanks to the associate membership status. The MERCOSUR includes a trade agreement tailored for the auto industry. Meaning that members can trade without tariff barriers and share a common vehicle plate number system. Mexico and MERCOSUR members benefit as well from this agreement, but with a limited number of units every year, due to a quota system. Foreign companies expanding their operations in the region have stated that the trade agreement tailored for the auto industry is an important benefit for the overall regional development. As a result, companies such as Mazda, Honda, Ford, GM, Renault, Cherry, Lifan and JAC have created new or expanding the current manufacturing facilities.

In the case of supporting industries such as parts and components suppliers, most of the companies are foreign companies. Which is a similar case to automakers in the region. One of the main advantages of foreign companies is the advantage on knowhow, technology and capital. These advantages create big entry barriers for new comers. Governments in Latin America are trying to reduce the dependence on foreign companies by creating the mechanism to transfer knowledge to local employees. Cases such as Argentina, are offering tax brakes incentives to vehicles manufactured locally. Other case is Venezuela, which is controlling the number of vehicles imported to the country and encouraging Chinese companies to establish operations locally. These two cases remain outliers of the overall auto industry regional structure.

The overall development of the industry in Latin America has not reach similar levels to countries like China or India. Nevertheless, the region remains at similar level.
to South East Asia. Mexico and Brazil are leading the way in terms of development structure, capabilities and size. Furthermore, 50 percentage of the population in Latin America is in Mexico and Brazil. These features indicate that the region will continue to attract auto industry related investment, and, in the future not distance, create national automakers and parts and components suppliers. First steps are being taken and relevant knowhow is being transferred.

The overall growth of the auto industry has the risk of stopping due to macro economic conditions and dependence of foreign companies. Nevertheless, in comparison with other regions, Latin America remains untapped and with large opportunities. Furthermore, during this expansion period, countries such as Brazil and Mexico have the opportunity of investing in green technologies and integrate the growth of the industry with city planning.

### 3.3.4. Brazil

Brazilian leaders’ thoughts about creating a national auto industry can be traced back until early 1910s. Already in 1910, Brazil had traffic congestion on its principal avenues. From 1907 to June 1920, 24475 automobiles were imported in Brazil. By 1920, Brazil had one vehicle for every 1400 inhabitants, in comparison; Venezuela had one vehicle for every 1421 and Argentina one vehicle for every 1281 inhabitants (Wolfe, 2010).

The development of the auto industry in Brazil helped to increase the middle class population. It also helped to create the infrastructure of roads to connect the country. In 1915, the Goodyear Tire and Rubber Company began constructing a factory in Brazil to also export to South America (Wolfe, 2010).

The political economic strategies implemented in Brazil to develop its auto industry, suggests a “mild” protectionist approach, in which gives preferential conditions to multinational companies that have manufacturing facilities in the country.
Similar to the development process of Thailand and Mexico, Brazil moved from protectionism and import substitution to free market strategies (Shapiro, 1991; Shapiro, 1994).

Brazil’s development process helped to attract investment from multinational companies to perform engineering and R&D activities, currently, these activities have been improved to the point to develop and design new products using global platforms (Quadros et al., 2005).

Automobiles with flex-fuel engines, engines that run with a mix of ethanol and gasoline, dominate the Brazilian market. Brazil started to manufacture flex-fuel automobiles in 2003. In 2003, it only represented 2.7 per cent of the total production and 3.5 per cent of the sales market Ten years later in 2013; flex-fuel automobiles reached 79 per cent of total production and 84 per cent of total sales (ANFAVEA, 2014).

The market size, fourth in the world since 2010, attracts significant FDI, while the relative high local content requirements push for localisation of parts and components manufacturing higher. Currently, in comparison with Mexico, the strategies implemented in Brazil can be categorised as integral and long run growth pattern. Brazil has stricter local content requirements helping the indigenous companies increase their role in the value chain.

Chart #16: Automobiles Production in Brazil

![Automobiles Production in Brazil](source: OICA)
Chart #17: Automobiles Exports from Brazil

Chart #18: Automobiles Production, Imports and Sales in Brazil
Conclusions

After examining, the development path of these auto industries it can be observed that the cost to implement sustainability strategies after the auto industries reached advanced development levels is higher than if the strategies were implemented earlier in the development process. Thus, the early implementation of the sustainability strategies in emerging industries could represent a source of competitive advantage for emerging countries.

Observing the cases of auto industries in matured and emerging auto industries provides an interesting comparison scenario. There are clear similarities to the development process of the emerging countries, such as the transition process from protectionism policies to a set of policies to open the industries to foreign competition.

An interesting case that can be further imitated is the case of the close collaboration of the government and private that Japan had in the early state of rebuild after the Second World War.
4. The Auto Industry in Mexico

This chapter focuses on the auto industry in Mexico. Automobiles started to be assembled in Mexico in 1925 when Ford opened the first automobile plant. Since then the auto industry has gone through protectionism and liberalisation development. Other emerging countries experienced these development periods as well, such as Brazil and Thailand. Nevertheless, Mexico has attracted more manufacturers. Mexico has been able to attract 10 automobile manufactures from the United States, Europe, and Japan. Among the main reasons why these multinationals decide to establish operations in Mexico are Mexico’s preferences to export to different markets and the comparative low labour costs.

In the last two decades, Mexico became an important manufacturing hub with important location and production cost advantage. This advantage has been reinforced with access to important export markets, thanks to the large portfolio of free trade agreements available for products manufactured in Mexico. Currently, Mexico has 12 free trade agreements with 44 countries. The most relevant agreements to the auto industry are signed with NAFTA, MERCOSUR and the European Union.

Despite the positive areas of the auto industry in Mexico, negative areas exist as well. For instance, due to the relatively weak education system, many multinational companies need to invest more in training and development (T&D) to fill the gap between local education and multinational companies’ requirements. In addition, due to the primary focus of increasing local production capacity, number of multinational companies, and export shares to developed markets; Mexico is depending on importing technological capabilities from developed markets, rather than fully concentrating on develop emerging markets related technological capabilities.

In addition, since most the companies in the auto industry are foreign, knowledge transfer is a crucial point for the future development. A reality of the labour market is that despite the growing population, skilled labour with broad industrial skills is limited.
Which affects the type of manufacturing processes and R&D activities that can be localized without offering the necessary training for the workers.

These and other characteristics of the auto industry in Mexico will be cover in this chapter, which is divided as follows: The First part (4.1) talks about the auto industry in Mexico development path. This section covers the public policies implemented from a historical point of view. This section shows the government’s attitude and efforts to develop the auto industry. The Second part (4.2) assesses the labour market and human resource development (HRD) strategies of automaker in Mexico. In this section the characteristics of the Mexican labour market is covered and a single case study is presented covering the example of a Japanese automaker’s strategy related with human resources management (HRM). The Third section (4.3) assesses the strengths, weaknesses, opportunities and weaknesses (SWOT) of the current state of the auto industry in Mexico. This SWOT analysis helps to identify key areas of Mexico’s current situation, which will serve to understand the following section. The Fourth section (4.4) covers the most relevant economic, social, environmental, and governance (ESEG) indicators of the auto industry in Mexico.
4.1. Development Path

Foreign direct investment (FDI) had contributed to the development of the Mexican auto industry. At the beginning, the majority of the foreign investment came from the United States; currently however, the continuous growth of the industries is attracting more FDI from diverse sources such as Europe and Asia (VW, Audi, Toyota, Nissan, Mazda and Honda). In the case of the Japanese companies, they have increased their investment by taking advantage of the strong Yen valuation during 2012-2014.

Similarly, to other emerging auto industries, the development path of the auto industry in Mexico has three main stages of public policies strategies; import substitution policies, liberalization policies, and export oriented policies.

4.1.1. Import Substitution Stage

Ford in Mexico City established in 1925 the first automobile plant in Mexico to assemble the Ford model T. This plant only had 295 employees. Afterwards General Motors opened its first automobile plant in 1937 and Automex in 1938. Automex later became Chrysler. During this early period existed only a 20 per cent local content policy, and the sales price was control by the government.

Later, Volkswagen and Datsun established their operations in Mexico in 1962 and 1966, respectively. During the 1960s and mid 1970s the government policies were categorized as Import Substitution Industrialisation (ISI) policies. These policies included: import taxes and local content requirements. Around this time, import substitution policies were common in other Latin American countries as well (Gereffi, 2009).

A presidential decree was passed in 1962 to increase the local content requirement to all the automobiles manufactured in Mexico to 60 per cent. This meant that 60 per cent of the value of the vehicle needed to be outsourced from parts and components made in Mexico (Bennett, 1986). In addition, projects related to the auto industry had a
49 per cent maximum of FDI. Furthermore, automobiles, engines and transmissions imports were limited and the government still was controlling sales prices.

A second presidential decree was passed in 1972. In a moved to outsource work to local suppliers, this new decree established that 40 per cent of parts and components could not be produced by the automaker. In addition, the decree indicated that automakers needed to export 30 per cent of the value of their imports (Vicencio-Miranda, 2007). Furthermore, a maximum of 40 per cent of the capital of parts and components factories were allow being FDI. This meant that a minimum of 60 per cent of the capital had to be Mexican (Bennett, 1986).

4.1.2. Liberalization Stage

A series of public policies started to change in the United States and Mexico in 1965. These policies started to allow exports of parts and components from the United States to Mexico. In the case of Mexico, these changes allowed its “Border Industrialization Program” take advantage of the possibility of establishing companies with 100 per cent foreign capital, as long as these companies only have the purpose of exporting to the United States. Subsequently, allowing assembled cars to be exported without tariff barriers to the United States. These policy changes lead to the creation of the maquiladora export industry in Mexico (Carrillo & Zarate, 2009).

However, not until late 1970s, the overall government policies were restructured towards neoliberalism. For instance, during the 1970s import barriers were eliminated in all the States in Mexico. Imports restrictions were eliminated, and local requirements were reduced to 36 per cent with the goal of increasing quality and exports (Barragan, 2005).

Additionally, an expansion of the maquiladoras program was implemented in 1977. This expansion gave more freedom to government officials in the United States and Mexico border state to approve maquiladora programs. Before this, the federal government approved all the maquiladora programs. This helped to increase the industrial development in states in the border with the United States. (Carrillo & Zarate,
As well, foreign ownership was also allowed for suppliers that exported autos (Barragan, 2005).

Mexico joined the GATT in 1986, and with this import tariffs were lowered. By 1989, the government were planning to show support to liberalize the industry even more. Nevertheless, automobiles import remained limited to 15 per cent of the local production. In 1993, this policy was increased to 20 per cent. In addition, 36 per cent of the local production value added needed to come from national suppliers (Fernandez Dominguez, 2005).

4.1.3. Free Trade Agreements Stage

After the North American free trade agreement “NAFTA” was signed in 1994, it marked a shift towards trade agreements and regional integration as main strength to attract foreign investment. In addition to NAFTA, there are 12 free trade agreements with 44 countries. Among then are the agreements with the European Union and MERCOSUR. These agreements give Mexico preferential access to European and the largest South American markets. Before the shift towards trade agreements as a strategy to attract foreign investment, only Ford, VW, Nissan, and Chrysler had production operations in Mexico (Barragan, 2005). Thanks to the shift towards free trade, other automakers, such as Honda, Toyota, and Mazda, have established new and expanded existing manufacturing facilities in the country.

4.1.4. Last Decade

The liberalization process of the early 1990s contributed to develop the capabilities needed to export automobiles around the world, expand foreign investment and increase manufacturing capacity. Mexico’s strategic geographical position next to the Unites States is one of the key areas that is contributing discover unique advantages of the country in relation to the industry.

Since the policies’ shift towards free trade agreements, the government has played a less interventionism role in the development of the auto industry. Rather it has focus
on creating the macroeconomic environment that supports and encourages FDI and foreign ownership. National content requirements have been replaced by regional content requirements. These requirements are established by the NAFTA agreement, in which Canada, the United States and Mexico work as a single production hub for automakers. Nevertheless, in terms of sales, each country remains with unique set of rules in areas of vehicles years, safety requirements, and environmental requirements.

During the last decade, the auto industry in Mexico experimented significant growth in terms of exports, local production and sales, despite the economic crisis of 2009. The chart below (#20) shows that production and exports levels in 2014 are above the levels in 2000, while local sales level in 2014 is in a similar level as in the year 2000. Unfortunately, import data is not freely available to public.

Chart #20: Auto Industry in Mexico

![Auto Industry in Mexico Chart](chart.png)

Until the present, Mexico has been able to attract 10 manufacturers from the United States, Europe, and Japan. These automakers have automobile and engine facilities around 12 states. Including all the related activities of the automobile industry, the activities of the industry expand to 26 Mexican states (AMIA, 2012). These 10 manufacturers support the employment of more than 60,000 workers. In addition, 511 suppliers are reported to be in Mexico. These 511 manufacturers support the
employment of more than 510,000 workers. These numbers show the importance of the supply network in the creation of jobs. In total, the auto industry in Mexico is reported to have more than 500 companies directly contributing the development of the industry.

Figure. #2: Structure of the Auto Industry in Mexico

All of the American automakers have several production facilities in Mexico. Their facilities spread around the Mexican border with the United States and around the central region of the country. In the other hand, the only European automaker is Volkswagen with a factory in Puebla. Audi has announced that it will open a factory in 2016 close to Puebla, in San José de Chiapas. Fiat produce vehicles in manufacturing facilities of its sister company, Chrysler.

In the case of the Japanese automakers, most of them are in the central region of Mexico. Mazda and Honda opened factories in 2014 in the State of Guanajuato. Toyota announced that it would build a factory in the state of Guanajuato, to be opened by 2019. Despite this new plant, Toyota has a small facility in Tijuana, focusing just on assembling cars to be exported to the United States. Nissan has plants in two states in Mexico, 2 plants in Aguascalientes and another plant in Morelos.
Regarding research and development (R&D) activities in Mexico, companies such as Honda, Mazda, and Toyota don’t have R&D activities located in Mexico. These companies still perform most of the research and development activities in Japan or in the United States.

Other examples exist, such as Volkswagen in Puebla. Volkswagen has 800 employees working on exterior & interior design, development and quality test. As well, the supplier Visteon has 2,500 workers in Chihuahua, designing and developing new products.

This mix scenario suggests that the main R&D activities are performed outside of Mexico, perhaps in the companies’ home countries. Nevertheless, the examples presented show that in the host country some R&D is taking place.
### Table #1: R&D activities in Mexico

**R&D activities in Mexico**

**Source: Secretariat of Economy (2012)**

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nissan</td>
<td>Toluca &amp; Mexicali</td>
<td>Parts and components modelling on CNC</td>
</tr>
<tr>
<td>Nissan</td>
<td>Mexico City &amp; Acapulco</td>
<td>Fuel and emissions research</td>
</tr>
<tr>
<td>Ford</td>
<td>Mexico City</td>
<td>Engineering and virtual design</td>
</tr>
<tr>
<td>Fiat-Chrysler</td>
<td>Mexico City</td>
<td>Fuel and emissions research</td>
</tr>
<tr>
<td>Volkswagen</td>
<td>Puebla (800 workers)</td>
<td>Exterior &amp; Interior design, development and test</td>
</tr>
<tr>
<td>General Motors</td>
<td>Toluca (800 workers)</td>
<td>Interior, air conditioning and quality test</td>
</tr>
<tr>
<td>Delphi</td>
<td>Chihuahua (2,500 workers)</td>
<td>Design and develop new products</td>
</tr>
</tbody>
</table>

*90% of the raw materials come from USA*

As well, indigenous supplier in the auto industry exits. Below is briefly presented the case of two local suppliers. These suppliers have been able to surpass important entry barriers to compete in the industry. These two companies belong to big Mexican conglomerates, thus helping them obtain competitive advantages.

Katcon makes catalytic converters. It was founded in 1993 in Santa Catarina Mexico. It has expanded to have manufacturing activities in China, India, Venezuela Australia, Poland and South Africa. The company has technical centres in SUA and Luxembourg. It belongs to the "Bienes Turgon S.A." Group.

Nemak is based in Monterrey and it focuses on manufacturing aluminium auto parts. Nemak is part of the Group Alfa is one of the largest Mexican conglomerates, which was founded in 1974. The group produces petrochemicals products, aluminium auto parts such as engine blocks and cylinder heads and extraction of oil and natural
gas. Alpek, another company in the group focuses on the petrochemical products (Hoshino, 2015).

The Case of Guanajuato State
The State of Guanajuato has been receiving most of the Japanese FDI in recent years. Besides, Nissan’s plants in Aguascalientes and Morelos, Toyota’s plant in Tijuana, and Honda’s plant in El Salto Jalisco, Guanajuato is attracting most of the Japanese investment. In addition, of Mazda, Honda, Hino, and Toyota’s forthcoming vehicles manufacturing facilities, a growing number of suppliers are investing in the state. As part of the agglomeration process and cluster formation process, first, second and third tier suppliers are investing in the state.

To facilitate the communication among the auto industry’s stakeholders in the state, and independent cluster association was form in April 2013, called “CLAUGTO”. Automakers, suppliers, academic institutions, and government offices integrate this association. In addition, the association has four teams to focus on areas such as supply chain, human resources development, purchasing, and innovation.

Conclusions
This section presents the path of development of the auto industry in Mexico and suggest the importance of that the public policies played in the overall development of the industry. Nevertheless, in comparison with developing countries such as China and Thailand, Mexico’s government played a less interventionist role in the development of the auto industry.

Mexico has been able to develop the industry to the point of manufacturing vehicles with the quality standards and specifications need it for developed markets. Mexico has been able to take advantage of its geographical location, relative low labour costs, and access to develop markets to increase its exports (AMIA, 2014).

The actions taken by the government suggests that Mexico is implementing an export-oriented strategy to develop its auto industry thanks to the NAFTA and other
bilateral trade agreements, and due to the relatively small size of its local automobile market size. Mexico is attracting multinational companies to establish manufacturing facilities in the country by offering access to the NAFTA market with lower production costs than US and Canada.

Figure. #4: Public Policies Overview in Mexico

<table>
<thead>
<tr>
<th>Year</th>
<th>Action</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>Establishment</td>
<td>Ford is the first carmaker to start assembly cars. 20% local content  Sale Price control by Government</td>
</tr>
<tr>
<td>1962</td>
<td>Import substitution</td>
<td>60% local content  49% limit of FDI in certain projects  Limit cars, engines and transmissions imports  Sales price control by Government</td>
</tr>
<tr>
<td>1972</td>
<td>Export promotion decree</td>
<td>Imports and exports must be balanced. 40% of parts can’t be produced by the automobile manufacturer</td>
</tr>
</tbody>
</table>

Table #2: Mexico’s Auto Industry Public Policies

Source: Own elaboration based on data from: AMIA, 2014; Barragan, 2005; Canfillo, et al., 2004; Canfillo & Zarate, 2009; ProMexico, 2013; Vicencio, 2007
40% FDI limit to components factories
60% Mexican capital minimum for suppliers

1977 Shift towards Exports
The United States / Mexican border starts to develop
36% local content (reduced to encourage exports)
Foreign ownership allowed for suppliers, but only to export

1984-1987 Local production restrictions
Restrictions to production lines and vehicle models per manufacture.

1986 Neoliberalism
Mexico joins GATT
Lower import tariffs

1989 Trade restrictions
Tighter trade balance is implemented.
Automobiles imports remained limited to 15% of the local production.
36% of added value should come from national suppliers.

1994 NAFTA
North American market access without duty tariffs
Shift towards FTAs
Shift from National content requirements to regional.
50% regional content from 1995 to 1997
56% regional content from 1998 to 2000
62.5% regional content from 2001
The United States’ companies invest massively
Besides NAFTA there are 44 FTAs, among the most relevant do to market potential are:
Colombia & Venezuela (1995)
Costa Rica (1995)
Bolivia (1995)
Nicaragua (1998)
Chile (1999)
European Union (2000)
EFTA (European Free Trade Association) (2001)
Japan (2005)
MERCOSUR
South Korea

Source
Own elaboration based on data from: AMIA, 2012; Barragan, 2005; Bennett, 1986; Carrillo & Zarate, 2009; Fernandez Domingues, 2005; ProMexico, 2013; Vicencio-Miranda, 2007
4.2. HRD in Mexico

This section covers the Human Resources Development (HRD) activities in Mexico. HRD strategies are part of the most important activities among multinational companies. Training is one of the key areas of HRD, which positively influences job performance. Multinational companies have to take into consideration the most appropriate HRD practices in order to develop host country specific advantages and if possible transferable practices that are location-bounded to home country (Verbeke, 2009).

In general lack of skilled labour can weaken knowledge transfer processes between home and host country. Furthermore, human resource without the appropriate skills can reduce companies’ quality standards and affect the overall company. Additionally, companies’ T&D strategies can be affected by macro internal and external conditions in both home and host countries, for instance, external conditions such as economic situation and labour markets.

Ghemawat (2001) states that home country firm specific advantages (FSAs) cannot be easily transferred; thus, multinational companies are constantly looking for the best ways and practices to transfer internationally home country FSAs, and at the same time, trying to optimize host countries’ location advantages and develop specific host country FSAs.

Host countries play an important role on shaping specify host country FSAs. When this happens, it is referred as “host country effect”. Verbeke (2009) defines it as the characteristics that multinational companies need to face on activities in places other than the home country.

For instance, Abo (1994) pioneered the term “hybrid factory” that explains the process of how Japanese multinational companies adapted home country FSAs by utilizing host countries’ advantages that could be transformed into host country FSAs.
Japanese multinational companies tend to invest heavily on their human resources training and development. There a large number of studies that argue that because of the large emphasis on training and development, Japanese companies have been able to use human resources knowledge and human resources management as a source of competitive advantages (Cox and Warner, 2013; Sparkes and Miyake, 2000; Abdullah, Ahmad and Takahashi, 2009).

4.2.1 Labour Market

The Mexican labour laws date from early 1900. Since the beginning, all workers have the right to belong to labour unions. In December 2013, the Mexican labour laws were modified. Nevertheless, these modifications appear not have a direct impact to the structure of the labour market. Nevertheless, overall, an important strength of the current labour union system is the prohibition of workers strikes.

Mexico has a labour force population of around 52 million, and 94 per cent of population is literate (World Bank, 2014). Nevertheless, due to the relatively weak access to skilled labour force, training is an important feature to attract and retain workers.

The national and local governments play an important role in the management of the educational system, including vocational institutes. The OECD (Kis et al., 2009) reported the weak links between employers and vocational schools. This situation happens due to the limited recognition of vocational schools in the labour market and low feedback from employers into the policy making process.

Nevertheless, there are important efforts made by the government at Federal and State level to increase the opportunities to receive vocational training. For instance, with the support of the federal government, States run the CECYTE (Colegio de Estudios Científicos y Tecnológicos) technical schools and the CONALEP (Colegio Nacional de Educación Profesional Técnica) (Kis et al. 2009).
Furthermore, in the state of Guanajuato, besides the technical schools that all states run, the state offers a set of scholarships called “Becate”. This scholarship program includes daily income, daily transport support, and free study materials. In addition, the state government is directly working with selected manufacturers in order to facilitate them with the right type of human resources.

The Mexican labour market has similar characteristics as in the United States. For instance, some external labour market characteristics are present, such as labour poaching and job-hopping. Companies have the flexibility to hire and layoff workforce based on their needs, as long as the law is followed. The external labour market incentivizes the movement of mid-career workers between rival companies and industries.

Differently from the United States, most of Mexico labour unions are in house. Many automakers and suppliers have official unions and are handled individually by each plant. For instance, Ford has three different plants in the country, and they have 3 different worker’s contracts. Also, Honda’s in house Mexican labour union started to work together with the Honda’s union in Japan. On July 2015, the network of automotive industry’s labour unions “CONSTA” was created. One of the main targets of this network of union is to streamline wages across the country. Among the labour unions members of the network are: Revolutionary Confederation of Workers and Peasants (CROC), Union workers and peasants (CTC), Federation of the State of Sonora (CTM), National Union of Workers (UNT), and Syndicate of Volkswagen.

Mexican labour market characteristics suggest that there is weak incentive for workers to develop their multi skills abilities because the benefits of developing such abilities are not reflected in their immediate career development. Workers tend to be trained to be multi skills if they have long run commitment with the organization. In general, external labour markets tend to discourage long run commitment and rewards employment mobility. As a result, seniority based knowledge transfer cannot be implemented as in other labour system, leading workers to develop occupational skills rather than firm-specific skills.
The labour market in Mexico prevents companies from offering continuous training like in the Japan; thus, companies in Mexico tend to provide training when it is required. According to the 2010 World Bank enterprise surveys, 16.3 per cent of companies identified labour regulations as a major constraint, in comparison with 17.9 per cent in Latin America and 11.2 per cent in the world (World Bank, 2014).

4.2.2. Multinational Companies Investments in Training and Development (T&D)

Many multinational companies, including Japanese ones, are investing in Mexico in order to take advantage of the low labour cost and Mexican trade preferences. For instance, it is possible to easily export to the United States and Canada thanks to the NAFTA as well to the MERCOSUR.

Differently from Japan, public investment for auto industry related training centres is limited, which opens the doors for private investment to fill the need of training and vocational schools. Nevertheless, the case of Mazda in Guanajuato State shows the collaboration of the state government with the automaker to set a training centre for future Mazda workers. The state government helped Mazda find the land and attracting candidates.

The local government work together with the private sector to attract workers to receive training in the companies. In the case of Guanajuato State, the government provide a system of basic skill certification that helps people join the labour force (SDES, 2014).

Ruiz (2009) explains that Mexican senior government officials consider that NAFTA was a driving force that encouraged the creation and development of national programs for T&D in order to help Mexican national companies be competitive.
A case study by Sparkes and Miyake (2000) of Japanese affiliates in Brazil and Mexico map out HRD practices that enhance the transfer of knowledge. They found that on-the-job and off-the-job training practices were the best practices to transfer knowledge.

Barragan and Usher (2009) found that up to the year 2000 Volkswagen Mexico helped 200 suppliers to get the ISO 9000 and VDA 6.1 certification through its “Institute of Training and Development”.

Research conducted by Contreras, Carrillo and Alonso (2012) found that Mexican local SMEs were upgrading their trajectory in the GVC thanks to knowledge transfer and spin offs from the leading automakers multinational companies established in Hermosillo, Mexico.

**Host country effects**

Due to the relatively weak education system, many multinational companies need to invest more in T&D to fill the gap between local education and multinational companies’ requirements. These differences make multinational companies adapt their T&D strategies to the Mexican context such as translation of Japanese materials into Spanish.

Since Mexico has open-market characteristics, organizations and workers can use to their best interest the labour poaching and job-hopping opportunities. As a result, multinational companies have to think of plans to retain their workers after they receive training. A collateral effect of this situation is the utilization of machinery and standardization in the various production processes. To prevent job-hopping, organizations offer their workers incentives and complete packages of benefits that go beyond wage increases. Training can be a good incentive included as part of the package.

Unlike the common practice in the Japanese labour system, multinational companies in Mexico need to create job descriptions that describe the job
responsibilities and expectations for each position in details. The Mexican market encourages having a clear relation among training, performance, and remuneration. Thanks to the detailed job descriptions, specific evaluation processes can be implemented.

4.2.3. A Japanese Automaker in Mexico

This section presents the example of a Japanese automaker HRD strategy in Mexico. The presented data is based on interview with Japanese expatriate that stayed in the Mexican subsidiary during a 5 years’ period.

**Company’s basic information**

The company started to manufacture in Mexico in 1985. This factory facility A is located in the central area of Mexico, in an industrial district in the suburb of a big city. In this facility, it produces motorcycles and automobiles. It has a production capacity of 60,000 automobiles and 100,000 motorcycles.

The company opened in 2014 a new automobile factory, facility B, to manufacture a subcompact automobile about 300 kilometres away from its current facility. It invested USD$800 million, and when is at full production capacity, 200 thousand units per year, it is expected to create 3200 new direct job positions.

In 2015, the company will open a continuously variable transmissions factory next to facility B, with a capacity of 700 thousand units per year employing 500 people. The company is investing USD$470 million to build the facility.

The company’s current operations are divided into engineering and service areas. The engineering side covers manufacturing, quality department, purchasing, logistics, and other related areas. The service side covers: sales, after sales, marketing, dealers’ relations, and other related areas.

Currently, the company employs 2800 workers. Approximately, there is a five per cent turnover rate for workers in the engineering area, and 20 per cent for the service
area. Workers in the service area tend to have skills that can be utilized inside and outside the auto industry.

The roles of the Japanese expatriates are to work in partnership with the local workers to transfer their knowledge, knowhow, and skills. Japanese expatriates are sent to the Mexican subsidiary for periods of 3 to 5 years.

**Recruitment**

The engineering and services areas recruit different types of human resources. For the service area, they recruit workers who already have industry background and a university degree. For the engineering side, neither of these requirements is compulsory because most of the workers are hired to work in the assembly line.

In overall terms, there are no barriers to recruit qualified employees. Open labour market characteristics are present, such as job poaching. Workers for the service area are poached from competitors and other related industries such as logistic companies and custom brokers.

The local government supported the process of selecting the location of facility B, in a city where high numbers of qualified workers was selected. This city is emerging as a hub by attracting skilled labour in different manufacturing and knowledge intensive industries.

**Training**

An immersion-training program is given to all new workers. This program is aimed to transmit the company culture and philosophy. The company opened a training centre in 2007. The headquarters in Japan have developed these training materials in English.

The engineering side workers receive a specific (standardized) training program developed by the headquarters. This program is implemented in all subsidiaries with little change. The company selects local workers that show a potential to become
managers in the future and give them opportunities to receive further training and career development programs in the United States or Japan for one year. After the workers return to Mexico, they transfer the acquired knowledge to the local colleagues.

Engineers with around 10 years of experience are transferred to the service area. These rotations help to transfer detailed engineering knowledge to service areas. Additionally, this rotation system contributes to understand the engineering methods and processes; as a result, helping in the relationship with dealers and customers.

In the case of the service area, there is no set up training curriculum implemented in Mexico. Thus, most of the T&D activities are conducted with a mentorship / partnership style. Japanese expatriates usually team-up with a local manager to work as a team on a day-to-day basis. However, language and cultural difficulties are present in the communication processes.

The Japanese expatriates provide feedback and suggestions to local managers in English. Afterwards, the local managers convey the message to their colleagues in Spanish. This partnership training method requires constant communication and mutual understanding between both sides. Cultural backgrounds are taken into consideration, and opinion differences are respected in order to reach mutual agreement and create better methods. This approach contributes to develop autonomy and problem solving capabilities in the local workers.

The different training approaches of the engineering and sales area are based on the distinct characteristics of each department. For instance, the processes of the service division are adapted to the Mexican market context; on the other hand, for the engineering workers there are global processes that must be followed in all facilities.

Workers that worked and received training by Japanese companies tend to be more attractive to be poached by competitors and suppliers. This situation suggests that the training received in the Japanese companies is highly attractive in the labour market.
Seniors local workers are leading the training efforts for workers in the new facility. The United States and Japan offices are only supporting the process and transferring required skills to manufacture the new products.

**Outcome**

There is no method to measure the T&D activities implemented in the service area. Nevertheless, these activities seem to provide the appropriate tools to transfer knowledge, knowhow, and skills from the Japanese expatriates. For instance, the first Mexican worker sent to Japan for training, was able to climb the career ladder and after more than 10 years, he was able to become one of the highest directors of the Mexican office.

**Conclusions**

The case of human resources development (HRD) practices in Mexico is a reflection of the unique characteristics of the labour market. For instance, in the Mexican open labour market, there is more difficult to implement peer knowledge transfer and seniority based T&D strategies as is implemented in Japan.

Furthermore, skilled workers are scares. Limited number of skilled labour force auto industry companies to invest in training programs. In addition, Japanese companies have the tendency to send expatriates from home country and other advance regions. Findings from Shiraki (2007) also support these conclusions.

This section shows that Japanese companies tend to adapt their training and development strategies to the characteristics of their host country. During this process, the companies are still transferring internationally FSAs and knowledge to workers in the host country. If this process continues successfully, it could help to create unique host country FSAs and increase host countries location advantages.
4.3. Mexico’s Diamond

This section implements the competitive advantage of nation’s theory or “Diamond model” from Michael Porter’s book “Competitive Advantage of Nations” (1990) to analyse the foundations of competitiveness of the auto industry in Mexico.

The diamond model consists of four determinants to assess the competitive advantage of a nation in a certain industry. The determinants are (1) factor conditions, (2) demand conditions, (3) related and supporting industries, and (4) firm strategy, structure and rivalry. In addition, two exogenous factors, chance and government, are included due to their potential to influence the national system or overall diamond. In general, each determinant affects and influences the source and level of competition in the auto industry.

Porter’s diamond model has been selected to analyse the source of competitiveness of the auto industry in Mexico with the understanding that Mexico’s auto industry diamond does not work alone. Mexico’s diamond works closely in conjunction with the United States and Canada’s diamonds. These three diamonds together can be categorized as the North American auto industry diamond. Nevertheless, the analysis of Mexico’s diamond by itself is necessary to understand which determinants are working by itself, and which determinants the United States and Canada’s diamonds are supporting.

4.3.1. Factor Conditions

The factor condition is the first area of Porte’s diamond model. Porter includes among factor conditions determinant areas such as labour, land, natural resources, capital and infrastructure. Based on each factor characteristic, the determinants are separated between basic and advanced factors. Natural resources, endowments resources, abundant cheap labour, and geographic location are included among the basic factors. Skilled workers, high tech infrastructure, research and development institutions and universities are included among the advanced factors. Advance factors tend to
provide a sustainable source of competitive advantage, while basic factors tend provide shorter periods of competitive advantage.

**Human Resources**

Human resources are one of the most important factors shaping the auto industry in Mexico. The education system and labour market conditions play an important role in the shape of the human resources. Furthermore, Mexico large pool of workers at disposal of the auto industry is a key strength (Barragan, 2005). In addition, as early as at the beginning of the 2000s, Esquivel and Rodriguez-Lopez (2003) show that due to technology transfers the gap between skilled and unskilled workers has been decreasing.

At regional level, besides Mexico’s progress, important human resources shortcomings are present locally. For instance, Schneider and Karcher (2010) research shows that the labour market conditions are not optimal in Latin American region, in spite of previous progress. Their research found regional features such as strong regulation, low skill levels, high turnover, weak unions and high informality. These shortcoming force companies to invest more on hiring, training and keeping skilled workers, than in developed countries. Furthermore, these shortcomings are affecting the manufacturing productivity of the region.

Mexico’s population is relatively young, suggesting an advantage in the working population. With a total population of 122 million, must of the population is between 25 and 54 years old and the labour force is around 52 million (World Bank, 2014). The figure below shows age segregation in the population.
Capital Resources

Capital resources are key to finance the growth of the industry. The auto industry in Mexico is being receiving increasing among of foreign investment. Increasing local capabilities and production localization are helping to attract new investment, from Ford, Honda, Mazda, Nissan, Toyota, VW and their suppliers. Federal and State governments are as well investing on improving infrastructure and structural weaknesses. Nevertheless, local capital remains limited.

In addition, Porter (1990) suggests that during early stages of industrial development, governments should support R&D activities; nevertheless, private stakeholders in the industry should be the main source of R&D activities, which could help to create a more sustainable industrial competitiveness.

Thanks to the localization of multinational companies, more capital is entering local industries, including investment to increase research and development (R&D) activities. R&D activities are essential for the overall development of the industry. For
instance, thanks to local R&D activities, Mexico could discover and develop unique procedures and technologies that could be converted into home country location advantages. Nevertheless, Mexico’s government investment in R&D is more limited than in the United States, Europe or Japan.

**Infrastructure**

Infrastructure type and quality, in areas such as roads, ports, transportation, and airports, have a direct influence in the development of the auto industry. The auto industry supply chain and distribution activities have a direct dependence on those infrastructure activities.

The infrastructure in Mexico’s and the Latin American region remains with important challenges. Perrotti and Sanchez (2011) study published by CEPAL, present that in Latin America and the Caribbean, investments in economic infrastructure (transport, energy and telecommunications) and derived services remains inadequate.

Cadena et al. (2011) argue that most Latin American cities have limited transportation and trade links between other cities in the region. They argue that economy of scale and trade can benefit remarkably, if cities in Latin America had better physical connection between them. Furthermore, the World Economic Forum in 2011 scored the transportation infrastructure in the Latin America region with just 3.2 points out of 7 points. In comparison, the European Union scored 5.3 points. Their report suggests that transportation infrastructure is key to the region’s development, especially for the auto industry.

Barragan (2005) argues that NAFTA contributed positively to the privatization of companies and increasing flow of inward foreign investment. Furthermore, Mexico’s infrastructure has been improving remarkably thanks to growing number of foreign companies investing in the country.

There are areas that still have weaknesses such as the transportation system. Nevertheless, this shortcoming could be an opportunity to create a transportation system
that is compatible with new trends of mobility and industry structures. For instance, a multimodal system can be created. A multimodal system incorporates the convenience of private ownership and public transportation convenience. Countries such as Japan already have a transportation system that provides flexibility to the users of choosing the appropriate method to fit their needs. In addition, new mobility trends, such as car sharing and driverless technology have the potential to improve mobility of less advanced systems.

In conclusion, Mexico has made important progress on areas related to factor conditions. Key areas, such as capital and human resources have advance to become advanced factors. For instance, low labour costs remain, but it is supported by increased investment on training and development of human resources. In addition, increasing number of foreign investment is becoming a key driver of infrastructure development.

4.3.2. Demand Conditions

The demand condition is the second area of Porte’s diamond model. Porter includes in the group areas related with the dynamics, size, growth rate, and characteristics of the market. Demand conditions characteristics encompass both quantity and quality of the demand. Porter calls the quality side of the demand the consumer’s sophistication. Is often the case that demand is evaluated by its size, but Porter suggests that characteristics, or sophistication, of the demand is more significant that the quantity of the demand. Porter explains it by explaining that consumers are able to influence companies’ innovation speed, furthermore it can help companies identify future needs and export the innovation of the home abroad.

Composition of demand (nature of buyer needs)

Mexico’s middle class market characteristics and level of sophistication are different from middle class markets in developed countries such as the United States Japan, and Europe. In the opposite side, Mexico’s top class market characteristics and level of sophistication are similar to top class markets in developed countries. Nevertheless, due to Mexico’s infrastructures limitations and wide inequalities between
rich and middle classes’ consumers, Mexico it is categorized as an emerging country. In addition, demand for new automobiles only reaches around one million per year.

Mexico GDP per capita was US$10,307 in 2013, while the “income distribution inequality index” or Gini coefficient was 48.07 points in 2012 (World Bank (b), 2014). The table below shows the Gini coefficient trend in Mexico during recent years. These numbers shows that while Mexico is not among the richest countries of the world, it has a wide gap between social classes and low wealth distributions.

Chart #21: Mexico’s Gini Coefficient

As a comparison, low-cost (US$10,000) and ultra-low-cost (US$5,000) vehicles are sold in India and China. Despite the fact that Mexico also has a population with limited purchasing power, there are no low-cost or ultra-low automobiles sold in Mexico. The large population with limited purchasing power suggest that low-cost or ultra-low automobiles could become an important segment of the market. Automobiles at lower prices could help to increase the new sales market. Furthermore, the living standards of Mexican citizens can improve by access to private transportation. Currently the citizens with lower income need to relay on an inefficient public transportation system.
One of the reasons why low-cost or ultra-low new automobiles are not popular in Mexico is the possibility of buying used automobiles in the United States at relatively good prices. For instance, medium size automobiles with engines of 2000cc are very common in Mexico. This suggests, that Mexico’s current vehicle population are similar to the United States in some areas. Additionally, around 80 per cent of Mexican automobile exports go to the United States and Canada every year (AMIA, 2014). Among other reasons, the large majority of automobiles sold in Mexico have similar characteristic as in the United States.

**Size and pattern of growth**

The diamond model indicates that the size and pattern of growth of home demand can help to develop the advantage of any industry with deep local roots. Mexico City is the largest city in the country, it also accounts for the largest automobile market, which leads to common traffic congestions. The size and pattern of growth of the demand helps to increase local manufacturing, attract investment and expand of local activities. Macro economic stability and ease of credit are increasing confidence, which as result is helping to increase the number new vehicle sales. In 2014, 1.1 million automobiles were sold in Mexico.

**Internationalization of Domestic Demand**

The diamond models indicate that a domestic demand with access to expand its influence internationally could have more opportunities to export products and services from local industries. Despite this, Mexico unique market preferences seem not to be transmitted across the region or to neighbour developing countries. In fact, opposite evidence exists, especially evidence related with the adaptation of new safety standards and CO2 emissions from the United States into Mexico.

Mexico’s production and export figures have been increasing in the last decade. Nevertheless, automobile exports in other Latin American auto industries are decreasing, such as Brazil and Argentina. In 2000, exports from the top five countries in Latin America reached 48 per cent of the production. In contrast, in 2010, exports just accounted for 44 per cent of total production. This data suggest that Latin American
local demand is growing and that automakers are mainly manufacturing vehicles to satisfy regional demand.

Mexico is the only exception. In 2010, Mexico exported 74 per cent of its production. By 2014, Mexico exported 79 per cent of its production (OICA, 2015; AMIA, 2015). In addition, more than 76 per cent of Mexican exports go to the United States and Canada, thanks to the North American free trade agreement “NAFTA”. The vehicles manufactured in Mexico are designed to meet quality and safety standards of developed markets. As a result, the Mexican local market is benefitted by selling vehicles with high quality and safety standards. In the negative side, the vehicles manufactured local designed with quality and safety standards for developed markets tend to have higher selling prices, which are difficult to access by Mexican with low income.

4.3.3. Related and Supporting Industries

The related and supporting industries are the third area of Porte’s diamond model. Porter includes in this determinant the relation and cooperation of the industry manufacturers and the network of suppliers. This determinant analyse whether this relation and cooperation contributes to gain international competitive advantage. Porter argues that a successful cooperation between these players could contribute to gain competitive advantage in related and other industries. The base of this argument is that related and supporting industries have the potential to collaborate in key technologies, and even to innovate on manufacturing processes. Porter further suggests that geographical proximity between related industries and its players can communicate more effectively and even foster the incubation of new ideas.

Supply Network

The supply network in Mexico is vertically integrated, similar to the global structure of the auto industry. A vertically integrated supply network is containing a cluster of companies that provided components and services between first tier, second tier and third tier suppliers. Thanks to this structure, suppliers have concentrated on
developing competitiveness in important businesses that directly support automakers. (Biesebroeck and Sturgeon, 2010).

During the early stages of the development of the auto industry, automakers were manufacturing internally many of the parts, components, machinery and tooling required to assembly vehicles. Trent & Monczka (1999) and Bensaou (1999) argue that automakers focus on gaining competitive advantage on core competences and continuous improvements in areas such as power trends and infotainment technologies. Improvements of this nature tend to increase the dependence on suppliers and key industries. Technologies advancements lead by suppliers in countries like Mexico help to increase the number of local high value added activities.

In the case of Mexico, most suppliers are foreign companies, such as Delphi, Magna Int., Johnson Controls, Bosch, and Visteon. Furthermore, thanks to the growing development of activities, many more foreign suppliers are establishing operations in Mexico, following their customer automakers. Indigenous companies are present as second or third tier suppliers. Nevertheless, indigenous suppliers are limited integrated in the local value chain (Barragan, 2009). The limited activities of the indigenous suppliers and limited access to capital are part of the areas that hamper their competitiveness. At the same time, the foreign suppliers use their global operations to cover high value added activities and parts and components research, development and design needs. Due to this situation, foreign suppliers outsource outside Mexico key activities that could help transfer knowledge to local workers.

On the positive side, there are examples of indigenous suppliers that are developing new technology in Mexico. Furthermore, a small number of knowledge intensive companies are being incorporated in the local supply chain (Contreras and Carrillo, 2011). A good example is the case of the company Camex-Tsusho presented by Plascencia and Carrillo (2013). Camex is a first tier supplier and subsidiary of Toyota Tsusho in the area of logistics. Nevertheless, despite being a subsidiary of a foreign automaker, Camex faced similar challenges to strive while being based in Mexico, such a handling a local workforce. Other examples related to the suppliers are
presented in section 4.5.1 discussing about the indigenous suppliers from the point of view of the sustainability economic dimension.

**Credit System**

Loans are common to buy vehicles in Mexico. Among other reasons, assess to credit is helping to increase the local market sales. This dependency in loans is expected due to the relatively low purchasing power in Mexico, and the relatively high cost of vehicle ownership. Furthermore, the positive macro economic conditions in Mexico are increasing consumers’ confident levels, which make the consumers, feel more secure at the time of making a big investment such as an automobile.

### 4.3.4. Firms Strategy, Structure and Rivalry

The firm strategy, structure and rivalry are the fourth area of Porte’s diamond model. Porter includes in this determinant the structures of firm creation, organization and management. In addition, this diamond area includes the structure of rivalry among industry players. The predominant firm strategy of automakers in Mexico seems to be to utilize Mexico’s geographical location advantage to develop an export hub with emphasis in North America but with global reach.

In the case of other Latin American countries, automakers tend to target local manufacturing capacity to satisfy local and regional demand. Countries such as Argentina and Venezuela even increased their local content requirements and tariff trade barriers. Brazil, Mexico, Argentina, Colombia and Venezuela markets combined, imported from outside the Latin American region 41 per cent of the vehicles sold locally in 2010. This means that 59 per cent of the vehicles sold in these five countries were manufactured in the Latin American region.

In more details, automakers strategies have been focusing on localizing manufacturing capabilities in Mexico to be able to export to North America with lower production costs, thanks to NAFTA (Barragan and Usher, 2009). In the case of Argentina and Brazil, automakers have been targeting the South American market
thanks to MERCOSUR. Mexico also has preferential access to MERCOSUR thanks to a bilateral agreement specially created for the auto industry.

Most of the vehicles manufactured in Mexico comply with global specifications and standards, because most of the vehicles manufactured locally are exported. Furthermore, the majority of automakers design, research and development activities are located outside Mexico. In Brazil, automakers manufacture small automobiles, small pick-up trucks, and small SUVs, all with flex-fuel engines. In Argentina, automakers produce medium size vehicles.

Table #2 shows the market share of the top ten brands in largest countries in Latin America. In Mexico, Statistics from AMIA shows that Nissan is the leader with 23 per cent market share, followed by GM with 19 per cent and VW with 16 per cent.

Table #3: Brand Market Share 2010

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<th>BRAND MARKET SHARE IN 2010</th>
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Sources: ANFAVEA, AMIA, ACARA, ANDI, CAVENEZ

The intense rivalry among automakers in Mexico, and in other countries in Latin America, is contributing to create clear strategies among each country. Furthermore, newly established automakers in Mexico are helping increase the competitive level in the country. As a result, automakers that established their operations decades ago are investing more capital to renew their facilities and bring more technology into the country.
4.3.5. The Role of Chance

The role of chance is one of the two external variables that have the potential to affect the complete diamond model. Porter includes in these determinants external activities that influence positively or negatively the industry. Often the chance section includes events that cannot be controlled the industry players or by governments. The main area that has the possibility to the overall industry is the chance of creating a single trade agreement among the main Latin American countries tailored for the auto industry.

Regional Integration

A single regional trade agreement tailored for the auto industry has the potential to benefit the overall region. In the case of Mexico, the expanding production capacity will help diversify the export destinations, and opens the door to manufacture locally vehicles designed in Mexico for other emerging markets in the region.

Furthermore, foreign companies in general could use the integration opportunity to utilize better the manufacturing capacity already established in the region by merging emission, fuel consumption, and crash standards. Furthermore, economy of scale in the production of part and components could be achieved. In addition, human resources, capital resources can be easily transferred. In addition, emerging markets with low market penetration can be reached with more affordable vehicle manufactured in the region.

The MERCOSUR regional block is a good example of first steps to integrate the region. MERCOSUR emerged in 1991 thanks to an economic and political agreement between Argentina, Brazil, Paraguay and Uruguay. MERCOSUR means “Southern Common Market”. In 2012, Venezuela joined the agreement. Bolivia, Chile, Colombia, Ecuador and Peru are associate members.

MERCOSUR contribute to encourage trade between members, and increase the percentage of goods manufactured locally. Mexico already has 12 trade agreements with 44 countries. Nevertheless, opportunities in neighbour developing countries
remain. Now these markets are relative small, but they could be an opportunity to design in Mexico vehicles for emerging markets.

Mexican and other Latin American leaders could contribute to the overall regional development of the auto industry by facilitating trade between countries. The main countries manufacturing vehicles are Mexico, Brazil and Argentina. The integration of the value chain of these countries could represent and important opportunities to streamline operations, reduce costs, and encourage national champions. Furthermore, Latin America roads and markets characteristics are relatively similar, which could help to sale similar vehicles across the region. Furthermore, markets characteristics such as consumer needs and purchasing power are relatively similar.

Some progress started to take effect with the establishment of the community of Latin American and Caribbean states “CELAC”. This community included 33 countries of the Central and South American region. The goal of this community is to facilitate communication and diplomatic relations between members. Furthermore, this community could serve as the platform to address other topics related with trade and economic cooperation.

Another important benefit of regional integration is the ability of designing and manufacturing vehicles targeting the Latin American region in general. Lessons can be learned from the case of the development of the Toyota Etios for South East Asian developing markets. The production facility is located in Kirloskar India, which is a hub for auto industry related companies. Sales in the Indian market started in 2010. The Etios is exported to other emerging countries in the area such as Bangladesh and Sri Lanka. In 2011, the Etios started to be manufacture in Indonesia, to be also exported to ASEAN markets. In 2012, the Etios started to be manufacture in Brazil, but exports to other countries in the region remain limited. Is expected that Toyota will increase production numbers in Brazil to expand the reach of the model.
4.3.6. The Role of Government

The role of government is part of the external variables that have the potential to affect the overall diamond model in a positive or negative manner. In general, governments’ policies play an important role in the shape and form of industrial development. Furthermore, governments can build the foundations to incentive industry’s international trade characteristics. In addition, governments’ policies have the potential to shape local competitive landscapes. For instance, prevent or encourage monopolies and national champions.

During the 2008-2009 financial crises, matured markets’ governments were able to play important roles to prevent certain industries from worse crises (Biesebroeck and Sturgeon, 2010).

In addition, Biesebroeck and Sturgeon (2010) government will keep playing interventionist roles when required, especially regarding production capacity transfers. The role of laws and incentives and well as the role of urban planning has been included to understand the overall role of the government in Porter’s diamond model.

Laws and Incentives

In a paper discussing the role of clusters, Michael Porter (1998) argued that the government should settle competition rules. These competitive structures can help to promote clusters and small and medium size companies. Furthermore, clusters can contribute to productivity gains and technology development.

To facilitate the development of clusters and companies in general, the government have the option of implementing laws and incentives. For instance, small indigenous companies are present in the value chain, as second and third tier suppliers; nevertheless, their presence is still limited. Laws and incentives that support the growth of these companies, especially on areas regarding technology and finance, can contribute to their development. Thailand can be a good example for Mexico to take in consideration. Thailand’s success in the automobile industry could be rooted on the close relation between government and private companies. This relation helped to
develop the country as an important production hub in South East Asia, while facilitating knowledge transfer from foreign companies (Intarakumnerd, 2009).

**Urban Planning**

Urban planning is one of the main areas that influence the structure of transportation and mobility. Due to its nature, governments are the main actors shaping the strategies of urban planning. Most of Mexico’s cities, and other countries cities in Latin America, cities grew without a comprehensive plan to incorporate the auto industry. In the contrary, many cities plans were created as a reaction to growth of the auto industry. Nevertheless, most cities have public agencies or offices that manage cities growth and development (Irazábal, 2009).

Governments have the chance to regulate and steer the structure of cities and auto industry development. In addition, governments can provide incentives to attract vehicles that fit the structure of the city, in order to regulate CO2 emissions, traffic congestions and noise pollution. Urban planning, is one the weak areas that the auto industry in Mexico possess, nevertheless, due to the relative low development stage, large opportunities still remain to plan and implement policies that help the overall growth of the auto industry.
4.4. SWOT Analysis

This section looks into the status of the auto industry in Mexico utilising strengths, weaknesses, opportunities and threats (SWOT) analysis.

Table #4: Sustainability Indicators of the Auto Industry in Mexico

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<th>SWOT</th>
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<td>Dependence on Exports</td>
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<td>Weak Indigenous Companies</td>
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<td><strong>Opportunities</strong></td>
<td>Young Demographic</td>
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<td>Network of Suppliers</td>
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<td>Links with Academic Institutions</td>
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<td>Sustainable Development</td>
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<td><strong>Threats</strong></td>
<td>Multinational Companies’ Dependence</td>
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<td>Dependence on the United States</td>
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<td>Scarcity Skilled Workers</td>
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<td>Autos for Developed Countries</td>
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<td>Low Local Value Added</td>
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4.4.1. Strengths

**Location Advantage**

Mexico’s geographic position contributes the ease of exports and imports. Mexico has access to both Pacific and Atlantic Oceans via the Gulf of Mexico, which helps to have access to its principal destinations: North and South America. Among the reasons, why Ford invested in manufacturing capacity in Mexico was its proximity to the United States but also market opportunities and lower production cost. Starting from the 1070s,
the Mexican government started to develop specific policies to attract investment to localize production capabilities close to the border with the United States, in a program called Maquiladoras.

Multinational companies such as Mazda, Honda, and Audi, made recent investment in Mexico indicating that the strategic geographical position and ease of access to foreign markets.

**Free Trade Agreements**

Mexico has been expanding its regional and bilateral trade agreements since joining the North American Free Trade Agreement “NAFTA” in 1994. Before 1994, Mexico had in place trade policies to protect the industry, but changed the approach and liberalized auto industry related trades during the 1970s. After the 1970s, Mexico started to implement public policies to attract foreign investment related with exports. Currently, Mexico has 12 free trade agreements with 44 countries. Trade agreements with NAFTA, MERCOSUR and the European Union are among the most relevant. Automakers still invest in Mexico to take advantage of its geographical location and ease to export to key foreign markets. As a result, Mexico exported 79 per cent of its production in 2014. The chart below shows the growing path of exports during the last five years.

Chart #22: Automobiles Production and Exports from Mexico
Increasing Attraction of FDI

Mexico is becoming an auto industry related production hub, thanks to the increasing amount of foreign investment. The effects are visible in growing number of parts and components companies arriving to the country, thus, creating a network of suppliers around the automakers.

According to data from Mexican Secretariat of Economy and ProMexico, Mexico received 1.9 million of US dollar in 2006 and 3.6 million of US dollars. In 2013, the auto industry foreign investment represented 9 per cent of the total foreign investment received in Mexico (ProMexico, 2014). These numbers show the growing trend of foreign investment by automakers and by part and components suppliers.

Foreign direct investment is helping to increase Mexico’s production capacity, suppliers’ network and exports. In the year 2000, Mexico just produced 1.9 million vehicles and exported 1.4 million. By the year 2014, Mexico produced 3 million vehicles and exported 2.4 million. On the negative side, external factors, such as the decisions that the foreign companies take outside Mexico to delocalize important value chain activities, heavily influence Mexico’s activities in the industry.

Chart #23: FDI into Auto Industry in Mexico (million USD)
4.4.2. Weakness

**Internal Market**

The internal market is one of the main weaknesses of the local auto industry. In 2014, new vehicles sales remained at similar levels as in 2006. At the same time, used cars imports from the United States strengthen the use of second hand cars. Used cars enter Mexico from North America relatively easily because of NAFTA. For instance, until 2014, there were no regulations that revised if cars entering Mexico were sold officially and legally in the United States. Fortunately, the Mexican government is increasing the entry barriers for second hand cars imports. For instance, pollution requirements for used cars are increasing. Nevertheless, the NAFTA trade agreement framework is an important handicap for the government to take concrete action.

Chart #24: Automobiles Sales in Mexico
High Dependence on Exports

All the automakers export most of its Mexican production. In 2014, 79 per cent of the local production was exported. The ease of exports is one of the main reasons why automakers establish manufacturing facilities in Mexico. Nevertheless, despite being an apparent strength, heavily depending on exports is an important weak area that is affecting the future of the overall industry. In the present, all of the vehicles manufactured in Mexico are design outside Mexico. In order words, this means that there are few activities related with research and development established in Mexico. The main reason is that, automakers offices designing vehicles for developed markets are located outside Mexico. If the export trend continues, it will be difficult for Mexico to localized high value added activities, such as vehicle design and development.

Table #4: Percentage of Exports from Production - Mexico

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Source: OICA & AMIA

Weak Indigenous Companies

New companies entering the auto industry have to face relative high entry barriers in comparison with other manufacturing industries. In the case of the auto industry, high capital investment, integrated value chain, environment restrictions, and safety regulations, are among the particular entry barriers for new comers. In recent years, the
case of Tesla Motors is one of the few success stories of new automakers entering the industry. Nevertheless, this case was in a developed market. Entry barriers are more noticeable in emerging countries. In the case of the auto industry in Mexico, all automakers are foreign companies. In the case of suppliers, most are foreign companies, because the entry barriers vary. There are scarce success examples of indigenous suppliers; furthermore, these suppliers still have limited activities in the value chain. Mexico policy makers could use the example of Thailand, which created investment programs to develop second and third tier suppliers that in the future could compete with foreign first tier suppliers.

Due to the open nature of the industry towards foreign trade, Mexico’s policy makers have a difficult scenario to foster the development of indigenous companies. It is too late for Mexico to implement protectionism policies to safeguard small indigenous companies, as happened in China and India. However, other routes could be explored to support the development on Mexican companies. Options, such as wider access to capital, technology development, human resources training and infrastructure are accessible for future implementation.

4.4.3. Opportunities

Young Demographic

Among the most important opportunities, that Mexico has is its large and young population. The World Bank (2014) reports that 46 per cent of Mexicans (56.2 million) are less than 25 years of age. This large young population can receive training focusing on gaining the skills required to become a driving force to develop the industry. By doing this, the overall economy benefits and the local vehicle market expands. Unfortunately, if Mexico misses this opportunity, it will be difficult to replicate.

Network of Suppliers

Thanks to the increasing inflows of foreign investment, the network of suppliers is also growing. Mexico has the opportunity to create a robust suppliers’ network that not only supply local production, but also export to foreign markets. Furthermore, a strong
and robust suppliers’ network can attract more investment and localize manufacturing activities with higher local values. In addition, a network of suppliers increases the chances to outsource activities to indigenous companies in the service industry.

**Industry Link with Academic Institutions**

Automakers have limited communication with academic institutions such as universities, vocational schools, and public training centres. This limit in communication creates an important opportunity that has the potential to increase the number of skilled workers. Furthermore, automakers and suppliers could provide direct feedback in order to improve the curriculum of these academic institutions.

Nevertheless, local governments, established automakers and new comers are taking have been working to take advantage of this opportunity. For instance, when Mazda and Honda arrived to the State of Guanajuato, the local government facilitated the opening of temporary training facility for blue workers joining these companies.

In addition, to transform the low number of skilled workers threat into an opportunity, local universities such as the Metropolitan Autonomous University and the Monterrey Institute of Technology are adapting their curriculums taking in consideration the growth of the auto industry.

Furthermore, since 2009, Volkswagen in Puebla in collaboration with the National University of Puebla State (UPAEP) created an undergraduate curriculum for a bachelor career in automotive design engineering. In 2009, 40 students entered as the first class, followed by 82 students in 2010, 153 in 2011 and 185 in 2012. In addition, Volkswagen created an electric engineering research centre in collaboration with the University of Americas in Puebla (UDLAP) (Volkswagen, 2012).

**Sustainable Development of Competitive Advantages**

Besides Mexico’s geographic location, costs and trade advantages, efforts should be applied to develop and strategy that attract more high value chain activities. High value chain activities such as research and development are not established across the
country. These activities have the potential to develop and sustain Mexico’s core competitive advantages.

Developed countries still have the ability to deploy design, software, research, and new technologies development activities. The industry’s highest value added activities tend to be localized in develop countries (Cullino et al., 2012). Nevertheless, in recent years India, Brazil, China and Thailand have been receiving more foreign investment related with these high value chain activities. If Mexico localized more of these activities, it could create sustainable competitive advantages. Mexico can create an advantage by differentiating these activities from the activities in the developed market. For instance, Mexico’s high value chain activities should focus on satisfying the needs of developing countries around Mexico.

4.4.4. Threats

**Dependence on Multinational Companies**

The auto industry in Mexico has been developing with the support of foreign companies’ investments. Until now, Mexico still does not have an indigenous automaker. The lack of an indigenous automaker suggests a threat for the future development of the industry. This threat is similar to the experience of other manufacturing countries such as Australia, in which, automakers stopped producing in the country due to shift on their production strategy. Shioji (2012) supports this idea by demonstrating that countries with local auto production owned by foreign companies are less competitive than countries with their indigenous companies. Mexico should reduce its dependence on foreign companies by encouraging the development of indigenous companies.

**Dependence on the United States**

More than 50 per cent of Mexico’s exports are destined to the United States. Despite superficial benefit, this represents an important threat for local production, especially when the United States market is in a down term, similar to 2009. To balance the exports, Mexico should study how to increase exports to neighbouring developing
markets. In order to do so, Mexico needs to localize the activities required to develop vehicles adapted for these markets.

Besides dependence on exports, key parts and components are imported to Mexico from the United States and Canada. Because of the NAFTA regional integration, imports and exports of parts and components between Canada, the United States and Mexico are allowed. Thus, many companies with operations in Mexico imports key elements of their operations from these countries. The parts and components’ dependence is also hampering the development and localization of part and components companies in Mexico. Nevertheless, this situation emerged from the structural integration of the industry. The Diamond analysis of the competitiveness of the overall industry explains this situation.

**Skilled Workers**

The increasing number of auto related activities create a high demand for skilled workers. Nevertheless, companies face challenges to hire and retain the appropriate type of workers; thus creating challenges in the supply and demand in skilled workers labour market. This situation is threatening the labour cost advantage of Mexico.

Examples such as Honda in Jalisco, in 2012 had turnover rates of five per cent for workers in engineering departments (including line workers) and a turnover of 20 per cent for workers in service departments. In addition, Ford highlighted the reduction in turnover from 44 per cent in 1988 to 4 per cent in 1994 (Carrillo, 2001).

An unbalanced labour market has the potential to affect companies hiring and training practices. For instance, in the case of Guanajuato State, multinational companies have to compete to retain their best employees due to high labour poaching activities. Some suppliers’ companies need to offer higher salaries in order to attract skilled workers from automakers. Besides higher remuneration, other companies are opting to offer training programs and career development opportunities as incentives. Many stakeholders believe that the best way to fix the shortages of skilled labour is by offering attractive training programs and reducing labour poaching.
In general, the activities done by some automakers, for instance Volkswagen in Puebla and Mazda in Guanajuato, to collaborate with local academic institutions seem to be the best path to overcome the threat of shortages of skilled labour. The results of these efforts will be observed in the long-term future. In the short-term, agreements to reduce labour poaching and turnover rates made by local cluster associations can have immediate effect in pool of skilled labour.

**Autos for Developed Countries**

The advantage of Mexico on manufacturing vehicles with the quality and standards of developed countries is a threat for the future of the local industry. Despite being an advantage for the overall industry, it creates entry barriers for indigenous and small suppliers. In addition, the vehicles manufactured in Mexico are mostly designed overseas, which prevents Mexico engineers from learning the skills and knowhow required to develop and design cars. Furthermore, the high quality standards and safety features included in the vehicles manufactured locally increase the cost of vehicles, which then results into higher retail prices. High retail prices in locally manufactured vehicles, prevents average income Mexicans from buying vehicles. In the future, this threat could prevent the fostering of local engineering capabilities and discovering local market specific characteristics that could be translated into competitive advantages to target other developing countries in the region.

Thailand is a good example of vehicles developed and designed locally for emerging markets. Despite the fact that all automakers in Thailand are multinationals, they are focusing local production capacity to build vehicles tailored for emerging countries in the region. Thanks to this approach, engineers in Thailand were able to identify unique market characteristics, thus, becoming a competitive advantage. For instance, Thailand is one of the leading manufacturers of small pick-up trucks. Furthermore, policy makers in Thailand decided to implement requirements for auto industry related foreign investment. These requirements targeted to attract investment focus on manufacturing vehicles with specific CO2 emissions and safety features (TAI, 2012).
Based on 2014 statistics from AMIA, most of the new vehicles imported to Mexico, came from Asian countries (258,319 / 43 per cent). While from NAFTA only 156,775, (26.1 per cent) were imported to Mexico. In 2014, 1,135,409 new cars were sold in Mexico; from the numbers 600,614 were imported vehicles, which is around 60 per cent. The growing relevance of the cars imported from Asian emerging countries represent and important threat.

**Low Local Value Added**

Most of the automakers in Mexico outsource important value chain activities to other facilities in developed countries. Activities such as R&D, software development, and design are spread around automakers global facilities. As a result, Mexico mains activities are related with manufacturing, assembly, and distributing products. These activities add low value to the finish good. Fujimoto (2007) suggests that R&D, manufacturing, and market distribution are the processes that add value in the auto industry. Observing Mexico from this perspective, manufacturing and market distribution processes are present, but R&D related activities remain limited across the country.

**Conclusions**

This SWOT analysis helps to identify Mexico’s positive and negative areas. SOWT analyses help to identify important areas that shape the current and future of the subject studied.

In this case, Mexico’s advantages are contributing to improve the weak points. For instance, companies establishing operations in Mexico are contributing to increase training opportunities for workers and localize a wider variety of value chain activities. Furthermore, Mexico’s attractive policies are continuously attracting foreign investment, which has the potential of creating an agglomeration effect between automakers and suppliers.
Among the less robust points of the auto industry in Mexico are the dependence on strong export markets and the dependence of technology imports from developed countries. Nevertheless, as the local industry grows, more emphasis will have to be placed on developing location-based advantages at company and industry levels.
4.5. Sustainability Perception

This section covers the most relevant ESEG indicators of the auto industry in Mexico. These indicators were selected from 15 stakeholder’s interviews transcripts. A text analysis method is utilised to identify the most relevant indicators mentioned by the interviewees. Among the interviewees were academics, company officials, clusters association and companies’ employees.

Furthermore, to facilitate the analysis process; the interviewees shared their views on the SWOT points of the industry. During the text analysis, this data collected was categorized based on the ESEG dimension that is related.

Due to the high interrelation between the indicators, there is information overlap between each other. Furthermore, the performance of one indicator could affect the performance of other indicators.

Table #6: Sustainability Indicators of the Auto Industry in Mexico

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Clusters of Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Local Activities</td>
</tr>
<tr>
<td></td>
<td>Target Market</td>
</tr>
<tr>
<td></td>
<td>Indigenous Companies</td>
</tr>
<tr>
<td>Social</td>
<td>Knowledge Spill Overs</td>
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<tr>
<td></td>
<td>Human Resources</td>
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<tr>
<td>Environmental</td>
<td>Green Manufacturing</td>
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<tr>
<td></td>
<td>Urban Planning</td>
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<tr>
<td>Governance</td>
<td>Communication among</td>
</tr>
<tr>
<td></td>
<td>Stakeholders</td>
</tr>
</tbody>
</table>

In the figure number 6, the author explains the relation of the ESEG dimension with the key stakeholders of the auto industry. The objective of this illustration is to facilitate the understanding of the relationship of each stakeholder with the four areas of sustainability.
ESEG relation with the four main stakeholders of the auto industry development

4.5.1. Economic Dimension

The economic dimension of the ESEG analysis looks the key economic indicators that contribute to or harm the long run prosperity of the overall auto industry.

The main indicators related to the economic dimension are covered in the local activities, target market, and indigenous cluster of indicators.

<table>
<thead>
<tr>
<th>Economic Dimension</th>
<th>SWOT</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Cost</td>
<td>Strengths</td>
<td>Local activities</td>
</tr>
<tr>
<td>Manufacturing capacity</td>
<td>Strengths</td>
<td>Local activities</td>
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<tr>
<td></td>
<td>Strengths</td>
<td>Weakness</td>
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<td>--------------------------------</td>
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<tr>
<td>Growing network of suppliers</td>
<td></td>
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<tr>
<td>Logistics in delivering parts</td>
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<tr>
<td>and components in modules</td>
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<tr>
<td>International quality standards</td>
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<tr>
<td>Access to land</td>
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<tr>
<td>Proximity to important Export</td>
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<tr>
<td>Markets</td>
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<tr>
<td>High dependence on FDI</td>
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<tr>
<td>Limited local R&amp;D</td>
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<tr>
<td>High dependence of parts and</td>
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<tr>
<td>components imports</td>
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<tr>
<td>Weak infrastructure to support</td>
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<tr>
<td>new tech vehicles</td>
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<tr>
<td>Growing economy</td>
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<tr>
<td>Railroad system to transport</td>
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<tr>
<td>goods</td>
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<tr>
<td>Parts and components exports</td>
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<tr>
<td>Manufacturing of premium</td>
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<tr>
<td>vehicles</td>
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<tr>
<td>Industry’s technology change</td>
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<td>to create new business</td>
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<tr>
<td>High import tax for aftersales</td>
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<tr>
<td>parts and components</td>
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<tr>
<td>Exchange rate</td>
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<tr>
<td>Geographical location</td>
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<tr>
<td>Weak currency (Mexican Peso)</td>
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<tr>
<td>Dependence of the United States</td>
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<tr>
<td>economy performance</td>
<td></td>
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<tr>
<td>Small local vehicle market</td>
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<tr>
<td>Increasing used cars imported</td>
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<tr>
<td>from the United States</td>
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<td>Strong requirements for new</td>
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<tr>
<td>car bank loans</td>
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<tr>
<td>Service Industry increasing</td>
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<tr>
<td>around the auto industry</td>
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<tr>
<td>High # of exports to the</td>
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<tr>
<td>United States</td>
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<tr>
<td>Rising labour costs</td>
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<tr>
<td>Locally produced chemical</td>
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<tr>
<td>products</td>
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<tr>
<td>Limited access to capital</td>
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<tr>
<td>Low production capacity</td>
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<tr>
<td>Limited infrastructure to</td>
<td></td>
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<tr>
<td>support new technologies</td>
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<tr>
<td>Weak brand recognition</td>
<td>Weakness</td>
<td>Indigenous</td>
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<tr>
<td>-------------------------</td>
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</tr>
<tr>
<td>Lack of import barriers inside NAFTA</td>
<td>Weakness</td>
<td>Indigenous</td>
</tr>
<tr>
<td>Development of local suppliers</td>
<td>Opportunities</td>
<td>Indigenous</td>
</tr>
<tr>
<td>Introduction of local brands to the after sales market</td>
<td>Opportunities</td>
<td>Indigenous</td>
</tr>
<tr>
<td>Imports from China</td>
<td>Threats</td>
<td>Indigenous</td>
</tr>
</tbody>
</table>

### Local Activities

The local activities indicator refers to the type of value chain activities localised in Mexico. The level of integration of the local activities with the global value chain reflects the relevance of Mexico worldwide auto industry. From the global value chain of the auto industry, the number of processes that are locally established determines the influence of the local activity in the overall chain.

#### Strengths of Local Activities

In comparative terms, the manufacturing activities in Mexico are characterised for having lower costs than in Canada and the United States. The stakeholders interviewed clearly mentioned this strength as one of the main comparative advantages of operations in Mexico.

Furthermore, manufacturing capacity emerged as one of the top strengths of the local industry. Manufacturing capacity is very important to reach the appropriate economy of scales. Leading to attract suppliers and other companies related to the industry.

The global auto industry has a unique set of characteristics, one of these is, the high entry barriers for new comers. The agglomeration theory talks about how automobiles manufacturers attract its suppliers to invest in manufacturing capabilities near their production facilities. This is especially true among Japanese automobile manufacturers and suppliers. Nevertheless, FDI has helped the creation of indigenous companies that work directly with multinational companies (Contreras, Carrillo, & Alonso Estrada, 2012; Ueda, 2009).
Due to the specific characteristics of the auto industry, it creates an agglomeration process. This process is created once one major auto manufacturer establishes a factory in a new region. Its largest parts and components suppliers will follow the manufacturer (Sturgeon & Van Biesebroeck, 2009).

The manufacturing capacity also contributes to increase the local logistics capabilities.

As manufacturing capacity expands, it becomes an important attraction for other companies without offices in Mexico.

Most of the local production activities established in Mexico are foreign companies. In other words, the local activities are growing thanks to FDI. In addition, foreign companies are establishing in Mexico operation following international quality standards and processes. These international quality standards are contributing to manufacture vehicles, parts, and components that can be exports to a variety of markets around the world.

Mexico possesses large amount of land that allows companies to build large production facilities. At the same time, the government is publicly supporting the expansion of the industry, among the different ways of supporting; local government has been helping some multinational companies in the legal and selection process of the appropriate locations to establish the manufacturing plans.

Furthermore, Mexico’s favourable geographical position helps companies to easily export and import finished goods, parts, and components. This location advantage in combination with low cost operations, growing production capacity, and international quality standards are the boosting strengths of the auto industry in Mexico.

**Weakness of Local Activities**

The auto industry in Mexico was developed thanks to foreign direct investment. The unique characteristics of the auto industry create high entry barriers for new players. At early development stage the auto industry in Mexico, indigenous companies
played an important role in the industry and created joint ventures with foreign companies. However, the lack of financial capital, among other reasons, made these indigenous companies eventually disappear.

High dependence on FDI emerged as one of the weaknesses of the type of local activities in the industry. Since most of the manufacturing capacity established is thanks to FDI, the future development of the type and among of activities is determined by the current foreign companies investing in the local industry.

Because of the high dependence from the headquarters, many local operations cannot freely increase their type and scope of operations. Furthermore, the types of activities established locally are perceived to focus on low knowledge level requirements. This leads to limited research and development activities. It can be observed from the auto industry’s value chain that only low value added activities are established in Mexico. In terms of product development capabilities, Mexico is in similar situation as other emerging nations. Nevertheless, Mexico is behind China, India, Brazil and Thailand in the development of local activities (Sturgeon & Van Biesenbroeck, 2009). In the end, limited research and development activities have direct influence in the future type of activities.

At the same time, most of the parts and components to manufacture are imported. Many of them are coming from Canada and the United States thanks to NAFTA. High dependence on parts and components imports is perceived as a weakness of type of activities being localized.

In addition to the limited local research and development activities localized, vehicles with new technologies, such as hybrids and electrics vehicles, have weak technological support. This reduces the interest of potential buyers. Among the limitations on infrastructure, the after sales service was mentioned to be one of the main weaknesses.
**Opportunities of Local Activities**

The growing economy is a broad opportunity that can help to further growth the local market of automobiles. The local market is one of the main weaknesses of the overall industry. Nevertheless, the growing economy has been contributing to the recovery of the local market. Thus, automakers producing locally are in advantage by supplying vehicles build produced.

Regarding the overall infrastructure supporting the industry, transportation of parts and components and finished good from factories to ports and vice versa, emerged as one the leading opportunities to improve the infrastructure of the industry. Currently, automakers have to use different types of methods to transport finished vehicles from the factories.

Thanks to the growing localization of automakers’ manufacturing activities, suppliers are also following them to establish manufacturing in Mexico. This creates the opportunity for these suppliers to export parts and components and not only supply locally. Mexico has the opportunity of becoming a part and component exporter, in conjunction with its export activities of assembled vehicles.

Among the FDI entering the local auto industry, premium vehicles manufactures, such as BMW and Audi, are expected to establish manufacturing operations in the country. This is a unique opportunity for the country to gain production capacity and knowledge for higher technology vehicles.

Manufacturing industries are well known for their labour intense activities and for being an important source of jobs. New technologies can contribute to decrease the overall number of assembly and manufacturing jobs. On the other hand, new technologies can open the doors to increase productivity and increase the number of skilled jobs in indirect production. For instance, jobs can be created in areas related with software, safety, and machines maintenance.
Threats of Local Activities

From the point of view of the local companies that import parts and components for the after sale markets, high import taxes represent an important threat to their businesses. Since many of the part and components they sell are not being manufactured locally, these companies high depend on other countries, such as China, to supply these parts.

In addition, local aftersales companies also depend on foreign currency availability to do business overseas. Volatility in currency exchange rates directly represents a threat to their businesses.

Local vs. Exports Markets

This indicator covers the importance of having a diversified and broad portfolio of markets. A diversified and broad portfolio of markets is important to keep production levels despite one market demand decrease.

Based on Porter (1990) competitiveness can be reflected from the number of goods that an industry exports (Porter, 1990). Despite this, the over dependence on exports can create long run weakness in the industry. If emerging industries mainly focus on exports, they are leaving the doors open for competitors, which could disrupt the original structure that gave international advantage in first place (Christensen, 1997).

Strengths of Markets

Mexico exports 76 per cent of production to the United States and Canada. The favourable location in combination with the access to market is an important strength. The NAFTA market represented 76 per cent of total Mexican exports in 2013, followed by Brazil and Germany with six per cent and five per cent respectively (AMIA, 2014). Mexico is one of the main exporters of vehicles to the United States. Only Canada and Japan export more vehicles into US.
The Mexican currency (peso) is weaker than the United States currency (dollar), contributing to make Mexican operations cheaper than in the United States.

**Weakness of Markets**

The overall Mexican Economy is strongly connected with the United States economy, resulting in direct positive or negative influence to the Mexican Economy. The Mexican sales market was also affected by the financial crisis in 2009.

The Mexican local market remains weak. In 2014, the number of sales level was similar to the sales level before the financial crisis in 2009 (AMIA, 2014). The automobile local market is strongly influenced by the overall macroeconomic condition of the country.

The local automobile market in Mexico has been receiving increasing number of used automobiles imports from the United States. This situation has been affecting the sales of new automobiles. The increasing number of automobile imports has been accredited to the weak implementation of imports policies (AMIA, 2014).

Furthermore, the local automobile market slow growth is perceived to be influence by the difficult access to loans and credit. Despite access to loans and credit is growing, it is still perceived as one important weakness.

**Opportunities of Markets**

The local service market has the potential to growth together with the growing manufacturing activity in the country. The stakeholders interviewed observed how small and medium local companies were increasing, especially companies in the service industry and providing service solutions to the foreign companies.

**Threats of Local Markets**

During the world financial crisis in 2008-2009, the high export dependency on NAFTA was transformed into a weakness. During the global financial crisis, the NAFTA automobiles sales dropped, considerably and as a result, the production in
Mexico dropped as well. Is important to mention that Mexico and NAFTA were not the only countries affected during this crisis, most of the developed markets were affected as well. Only some emerging markets such as China, India and Brazil were not affected by the crisis thanks to their strong internal market.

Due to the high demand and the limited supply of high skilled labour forced, companies have to offer attractive compensation and packages to attract and retain good workers. This is creating a competitive cycle between companies, trying to have the best labour force, while at the same time is creating high rotation figures. Furthermore, the risk of workers leaving the company is affecting the type of training that companies are offering.

Indigenous Companies

This indicator covers the indigenous suppliers involved in the auto industry in Mexico. The majority of the first and second tier suppliers established in Mexico are multinational companies. In the case of Mexico, only a small number of companies can be categorised as indigenous. Because most of the important suppliers established in Mexico, are owned by foreign companies.

**Strengths of Indigenous Companies**

The more indigenous companies emerge and foreign companies are locally established, the likelihood that the industry will remain competitive in that country is higher. The number of indigenous companies is very important, but more important is the role of these companies in the industry.

Among the stakeholders interviewed, the advantage of locally supply locally produced chemical products was mentioned as strength among the indigenous companies in Mexico.

**Weakness of Indigenous Companies**

One of the main challenges that small and medium companies often mentioned, was the difficulty to access capital to finance their production capabilities.
improvements. In addition, because of the relative low production capacity and capabilities with multinational suppliers, small and medium third tier suppliers find difficult to win future contract with first and second tier suppliers.

Furthermore, the limited capital, production capacity, capabilities; harms the changes that indigenous companies have to implement new technologies and catch up foreign companies.

In addition, weak brand recognition is present among the local after sales parts and components makers. In the aftersales, market competition is strong, and recognized brands tend to be better considered.

Moreover, the lack of import barriers inside NAFTA contributes to create a competitive market in which foreign and indigenous companies have to compete equally. This generates an asymmetrical competition resulting that foreign companies have better structures than indigenous companies, which tend to have weaker supports.

**Opportunities of Indigenous Companies**

Due to the large number of foreign companies, opportunities to develop indigenous companies remain untapped. Opportunities exist in the supplier’s value chain, as second or third tier supplier, and as well as manufacturing parts and components for the after sales market.

**Threats of Local Indigenous Companies**

Imports from China including parts and components emerged as an important threat to indigenous companies. It was mentioned to be an important aspect for the future of the overall auto industry in Mexico, due to the fast growth of the Chinese industry, which includes a large number of indigenous Chinese companies. Now Chinese companies start to open facilities in Mexico or export parts and components to Mexico. Their cost structure, production capacity and capabilities will serve as an advantage, and will be difficult for indigenous Mexican companies to compete directly.
4.5.2. Social Dimension

The social dimension looks the key social indicators that contribute to or harm the long run prosperity of the overall auto industry. The exact definition of a social dimension in relation to sustainability has not been clearly defined (Dempsey, Bramley, Power, & Brown, 2011).

The following social indicators emerged from the interviews. The main social dimension’s indicators are encompassed in the human resources and spill over’s clusters.

Table #8: Social Dimension’s Indicators

<table>
<thead>
<tr>
<th>Social Dimension</th>
<th>SWOT</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited communication between academic and industry institutions</td>
<td>Weakness</td>
<td>Spillover</td>
</tr>
<tr>
<td>Limited number of skilled workers</td>
<td>Weakness</td>
<td>Spillover</td>
</tr>
<tr>
<td>Limited HR training capabilities for local second and third tier suppliers</td>
<td>Weakness</td>
<td>Spillover</td>
</tr>
<tr>
<td>Training Programs in partnership with local stakeholders</td>
<td>Opportunities</td>
<td>Spillover</td>
</tr>
<tr>
<td>Limited number of Skilled Workers</td>
<td>Threats</td>
<td>Spillover</td>
</tr>
<tr>
<td>Large labour force</td>
<td>Strengths</td>
<td>HR</td>
</tr>
<tr>
<td>Hiring flexibilities (open labour market structure)</td>
<td>Strengths</td>
<td>HR</td>
</tr>
<tr>
<td>Social insecurity</td>
<td>Weakness</td>
<td>HR</td>
</tr>
<tr>
<td>Limited foreign languages proficiency in local labour force</td>
<td>Weakness</td>
<td>HR</td>
</tr>
<tr>
<td>Low salary for workers</td>
<td>Weakness</td>
<td>HR</td>
</tr>
<tr>
<td>Increasing population</td>
<td>Opportunities</td>
<td>HR</td>
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<tr>
<td>Tourism</td>
<td>Opportunities</td>
<td>HR</td>
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<tr>
<td>Labour poaching</td>
<td>Threats</td>
<td>HR</td>
</tr>
<tr>
<td>Culture differences leading to HR Issues</td>
<td>Threats</td>
<td>HR</td>
</tr>
<tr>
<td>Foreign companies can be categorised as local companies</td>
<td>Threats</td>
<td>HR</td>
</tr>
</tbody>
</table>

**Spillovers**

This indicator observes the level and type of spillovers present in the auto industry in Mexico.

Because most the companies related with the auto industry are multinational companies, whether there is evidence of knowledge transfer and what are their effects are very crucial points for the future development of the auto industry in Mexico. The less developed a country is, the greater expectations are put on FDI to alleviate its resources and skill constraints (Noorbakhsh, Paloni, & Youssef, 2001). Furthermore, due to the special characteristics of the industry, specific knowledge about production process, R&D etc. are key areas to develop competitive advantage (Fujimoto, 2007).

Thanks to the increasing among of FDI entering the auto industry in Mexico, the possibilities of knowledge transfer and general FDI spillovers are greater. FDI even can help to integrate indigenous companies into the global value chain. Contreras, Carrillo and Alonso (2012) found that Mexican indigenous small and medium size companies upgraded their position in the global value chain, thanks to knowledge transfer and spin offs from the leading automakers multinational companies established in Hermosillo, Mexico (Contreras et al., 2012).

At the end, the positive benefits of knowledge spillovers are considerable. It can help bring up the education and life level of its habitants. Furthermore, knowledge spillover can help improve the type of human resources available for auto industry and other industry; thus contributing to the long run development and sustainability of the auto industry.
For instance, many multinational companies sent expatriates from headquarters to Mexico for short and long periods. The main objective of these expatriates is to transfer their knowhow and knowledge to their local counterparts. Many of these expatriates work on daily basis together with local managers. As a result, local managers are trained under a variety of situations and on handling different types of situations.

**Weakness of Spillovers**

The limited communication between academic institutions and auto industry is one of the main weaknesses affecting the knowledge transfer of technologies. This situation also influences the gap between the curriculum offered by academic institutions and the needs of the auto industry companies.

Despite the growing population, skilled labour with broad industrial skills is limited. Affecting the type of manufacturing processes and R&D activities that can be localized without offering the necessary training for the workers.

The access to capital limitation that second and third tier local suppliers have also affects the types of training that can be offered to the workers.

**Opportunities of Spillovers**

Training Programs are very important tools to transfer knowledge. In the auto industry, multinational companies have important manufacturing and operation knowledge. Among the possible options to transfer this knowledge, training emerged as a strong opportunity.

The government has already created programs to provide training tailored for manufacturing industries. Nevertheless, opportunities exist to increase the number of these programs.
Universities as well are creating university courses tailored to develop skills for the different manufacturing industries. Nevertheless, the multinational companies are not directly involved to develop these courses.

Companies in general develop constantly their human resources; this is specially the case of multinational companies in Mexico. Briscoe and Schuller (2004) say, “When enterprises operate subsidiaries and partnerships overseas, the training of the members of their global work force takes on special importance” (Briscoe & Schuler, 2004). However, companies cannot just implement the same successful home country training strategies in host countries, thus many multinational companies sent headquarters expatriates to provide training to local staff.

On-the-job and off-the-job training programs are common training strategies in Mexico. Sparkes and Miyake (2000) of Japanese affiliates in Brazil and Mexico found that on-the-job and off-the-job training practices were the best practices to transfer knowledge (Sparkes & Miyake, 2000).

For instance, in the year 2000 Volkswagen Mexico helped 200 suppliers to get the ISO 9000 and VDA 6.1 certification through a program called “Institute of Training and Development”(Barragan & Usher, 2009).

**Threats of Spillovers**

Limited number of skilled workers emerged as one of the main areas that represented a threat to the industry. The interviewees pointed that this is due to limitations in the education system.

In the long run, the limited number of skilled workers has the potential of limiting the number of technology intensive operations in the country.

**Human Resources**

Human resources are an integral part of any industry, including the auto industry. The auto industry in Mexico needs the correct type of human resources in order to
develop to its maximum potential. In this section the principal characteristics of the human resource cluster are discussed.

**Strengths of Human Resources**

The young population of the country suggests the access to a large labour force. Nevertheless, as mentioned by other indicators, the number of skilled labour remains low. The strength of the large labour force is present for low technical jobs. Henderson (1997) suggests that industrial concentration and access to labour diversity are important to develop an industry (Henderson, 1997).

The open labour characteristics are attractive for foreign companies, providing them with foreign and local companies with the flexibility to hire labour when is required.

**Weakness of Human Resources**

Social insecurity emerged as one of the key social weakness in the country. In recent years, the insecurity has been increasing making foreign investors nervous. Despite this situation, states such as Guanajuato are widely known for their level of security. However, multinationals companies would like to see improvement of the overall sense of security in the country.

Mexico’s official language is Spanish. Foreign companies’ expatriates often struggle to communicate with local staffs that do not speak English. This is especially common when foreign companies are stabilising their operations in Mexico. In these cases, most of the companies’ materials, instructions and operations details must be translated into Spanish.

Salary in Mexico is perceived as weakness from the perspective of local employees. Mexican scholars suggest that when local workers compare themselves with workers in the United States or Canada doing similar jobs, the average salary is lower in Mexico. From this perspective, it can be perceived as weakness in the social dimension, but also as competitive advantage strength in economic dimension.
Opportunities of Human Resources

Mexican growing population emerged as one of the social strengths influencing the auto industry. The future population growth is one of the reasons why new multinational companies, such as Honda and Mazda, are heavily investing locally.

The growth of the auto industry in Mexico has the potential of increasing the numbers of visitors to the country and the tourism industry in general. The interviewees from Guanajuato mentioned that the impact in tourism is already visible in the state.

Threats of Human Resources

One of the key threats in the social dimension is the increasing labour poaching activities resulting from the limited number of skilled labour and increasing auto industry related activities. Private organizations such as the Guanajuato Automotive Cluster is in discussions with the different local stakeholders to help facilitate the dialogue and reach a consensus to reduce labour poaching.

Because of foreign management establishing operations in Mexico, differences in human resource management styles and cultures, have the potential to create social issues. Foreign companies understand these threats thus try to handle their newly established operations carefully and without major incidents.

Many interviewees referred to multinational companies’ operations established in the country as local companies. Which suggests that multinational companies’ local operations and indigenous companies’ operations are observed as equal. This creates the threat of misinformation of the capabilities developed by indigenous companies versus the multinational companies’ ones.

4.5.3. Environment Dimension

The environment dimension of the ESEG analysis looks the key environmental indicators that contribute or harm the long run prosperity of the overall auto industry.
In the mid-20th century, pollution from industrial activity was not seen seriously due to economic benefits and external costs (Ashford & Hall, 2011). Afterwards the environmental concern increased and led governments to make tougher policies to reduce the impact of automobiles to the environment.

The main indicators related to the environment dimension are covered in the green manufacturing and urban planning cluster of indicators.

Table #9: Environment Dimension’s Indicators

<table>
<thead>
<tr>
<th>Environment Dimension</th>
<th>SWOT</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>No recycling policies</td>
<td>Weakness</td>
<td>Green Manufacturing</td>
</tr>
<tr>
<td>Water recycling and reuse</td>
<td>Opportunities</td>
<td>Green Manufacturing</td>
</tr>
<tr>
<td>Weak city integration with the auto industry</td>
<td>Weakness</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>High concentration of vehicles in cities</td>
<td>Weakness</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>Limited public transportation system in rural areas</td>
<td>Weakness</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>Railroad network for passengers and goods</td>
<td>Opportunities</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>Low contamination technologies</td>
<td>Opportunities</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>Traffic congestions</td>
<td>Threats</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>Decreasing agricultural activity</td>
<td>Threats</td>
<td>Urban Planning</td>
</tr>
<tr>
<td>Increasing pollution from old vehicle fleet</td>
<td>Threats</td>
<td>Urban Planning</td>
</tr>
</tbody>
</table>

**Green Manufacturing**

Green manufacturing refers to manufacturing activities that take in consideration sustainability principles. Green Manufacturing includes all the activities of the auto industry’s value chain; starting from suppliers manufacturing processes until the end of life of the automobile. In principle, green manufacturing takes cares of environmental
externalities that industrialization creates, and try to make an adequate balance with industry growth.

Automobiles are commonly associated with negative or cost externalities to the environment. However, green manufacturing tries to implement the less harmful process into the value chain of the industry.

There are limited value chain’s manufacturing activities established in Mexico. Despite that, these activities could harm the environment extensively. Furthermore, there is a lack of comprehensive public policies to create Green Manufacturing. This is observed in the feedback received from the interviewees.

Weakness of Green Manufacturing

The lack of recycling activities in Mexico emerged as a weakness of the industry but also as an opportunity. For instance, there is no recycling policy targeting the auto industry, which is affecting negatively the environment.

Ocampo et al. (2010) highlight the need of creating public policies to regulate the activities and externalities created by the small but growing dismantling industry in Mexico. The study shows the lack of the appropriate infrastructure to perform dismantling activities, which is harming the surrounding environment (Sanchez Ocampo, Gonzalez Torres, & Gutierrez Ocampo, 2010).

Nevertheless, because the auto industry in Mexico is still in development stage, there are opportunities to implement policies that emulate international standards.

Opportunities of Green Manufacturing

Water recycling and reuse emerges as the main opportunity area that the auto industry can support. The industry is growing in states that have supply shortages of clean water. As a result, investment to tackle the problem is increasing. Water shortage problems increase as growing number of people move into cities close to the auto manufacturing facilities.
In cases such as the State of Guanajuato, which is affected by shortages of clean water supply, companies such as Mazda are implementing water treatment machines and procedures that are contributing to solve the clean water supply problem.

These initiatives and easy access to basic services such as electricity are important factors that influence the process of selecting the locations for manufacturing facilities.

**Urban Planning**

Urban planning in the context of the auto industry refers to the development process of urban areas and the auto industry working together to improve mobility and reduce negative environmental externalities.

In the context of sustainability indicators, the interviewees’ responses related to environmental externalities have been consolidated into the urban planning cluster.

Synergy has to be achieved between stakeholders, city planners, policy makers and auto industry’s firms, to coordinate successfully the development of the industry and urban areas. Lucas et al., (2010, pp127) argue, “Sustainable communities should be well-connected, with good transport services and communication linking people to jobs, schools, health and other services” (Lucas, Jones, Allen, & Manzi, 2010). Private automobiles and public transport play an important part of this development.

As the auto industry grows, mobility of cities is affected. When cities do not have an appropriate transportation system, habitants turn to private solutions to satisfy their mobility needs. When the majority of the population buy private automobiles, congestion is created and mobility is affected.

**Weakness of Urban Planning**

Despite the progress of the largest Mexican cities, local government still lacks a comprehensive plan to prepare their cities for the growth of the automobile population. Based on the latest reports from AMIA and INEGI (2014), Mexico only has nine
vehicles per hundred habitants, which is lower than Argentina and Brazil. Notwithstanding the relative low number of vehicles, the auto industry’s stakeholders should be planning and preparing ahead of time on how to find an appropriate balance between vehicles and urban growth.

In contradiction to the relative low number of vehicles per habitants in the country, traffic congestion is a very important problem in the largest Mexican cities. Due to the increasing congestion problems, the rapid bus transit system plays an important solution improving mobility. Mexico City already has a rapid bus transit system. This system consists on dedicated street lanes for the busses, avoiding all the cost related with congestion, such as fuel consumption. Wohrnschimmel et al., (2008) found that implementation of the rapid bus transit system in Mexico City helped to reduce commuting time and CO exposure to the commuters (Wohrnschimmel, Zuk, Ceron, Cardenas, 2008).

The integration of the public transportation system with the auto industry is not common; public transportation network was developed because of increasing population and congestion problems, rather than as a proactive measurement of city development. As mentioned, Mexico’s largest cities are including measurements to reduce congestion and improve mobility. Nevertheless, public transportation remains weak in rural areas. Intercity public transportation mainly is centred on bus network.

**Opportunities of Urban Planning**

The auto industry development in Mexico is contributing to strengthen the transportation infrastructure of many cities. As Bolio et al. (2014) highlight; infrastructure opportunities are key areas that can contribute to further growth in many Mexican industries (Bolio et al., 2014).

An intercity railroad network emerged as a key opportunity to improve the nationwide infrastructure. Cadena et al. (2011) mention the remarkable opportunities available in many cities In Latin America, including in Mexico (Cadena, Remes, & Restrepo, 2011). In the case of Guanajuato State, the automobile manufacturing
facilities are spread among the state in different cities, but there is no efficient public transportation system. As a result, companies need to invest into private transportation solutions for their workers. One of the solutions proposed by the interviewees is the development of a railroad system that loops the different cities transporting passengers and goods.

In addition, the integration of green technologies into the transportation system represents an important opportunity for the industry. Low contaminating or green technologies developed and manufactured locally can be utilized to improve the public transportation system. Thanks to the increasing localization of manufacturing activities and labour expertise, new technologies can be manufactured locally helping the local economy and creating jobs.

**Threats of Urban Planning**

One of the most important threats to the auto industry growth is traffic congestion. As the population grows the use of private, vehicles tend to increase as well, creating congestion issues. Most cities have difficulty trying to find a balance between vehicles fleet and city development. Bolio et al. (2014) predicts that Mexico’s vehicle fleet will grow 5 per cent annually (Bolio et al., 2014). In Mexico’s largest cities, traffic congestion is already present during rush hours, but as vehicle fleet increases, the problem will grow as well, unless the correct measurements are taken into place.

As the manufacturing activity increase in the country, the threat of losing agricultural land and production capacity should be a concern to public policy makers and society in general. The right balance between manufacturing and agricultural industry should be found in order to sustainable economic growth.

The lack of comprehensive policies to control vehicle fleet growth represents an important threat to environment pollution such as CO2 emissions. Mexico lacks the mechanism to discontinue old vehicle, which is leading to the increasing age of the vehicle fleet.
4.5.4. Governance Dimension

The governance dimension looks the key governance indicators that contribute or harm the long run prosperity of the overall industry.

Good governance is required to reduce vulnerability and risk in the country and industry. Stakeholder engagement plays an important role in order to understand and have a close communication between the stakeholders.

The following governance indicators emerged from the interviews. The main governance dimension’s indicators are encompassed in the stakeholder’s engagement cluster.

Table #10: Governance Dimension’s Indicators

<table>
<thead>
<tr>
<th>Governance Dimension</th>
<th>SWOT</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government support at federal and state level</td>
<td>Strengths</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Ease to import &amp; export inside NAFTA</td>
<td>Strengths</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Diverse number of trade agreements</td>
<td>Strengths</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Low taxes</td>
<td>Strengths</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Safe / security in Guanajuato State</td>
<td>Strengths</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Labour poaching</td>
<td>Weakness</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Low wages</td>
<td>Weakness</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Limit information about the overall industry capabilities</td>
<td>Weakness</td>
<td>Stakeholders’ Co.</td>
</tr>
<tr>
<td>Weak links between local second and third tier suppliers</td>
<td>Weakness</td>
<td>Stakeholders’ Co.</td>
</tr>
</tbody>
</table>
Stakeholders’ Communication

This indicator observes the type of communication among the principal stakeholders of the industry. An appropriate stakeholder engagement system is not a consensus between the stakeholders, but in contrast an increasing alliance between all stakeholders.

Despite the level of operation of national, corporate, or international governments, all of them must know and understand who their stakeholders are and how to approach them. Part of the Mexican national government agenda is to create the correct business environment to continue attracting FDI. Thus, all levels of government are trying to create the right business environment to keep attracting new investments.

Elkington (1998)’s four firms’ responsibilities and the triple bottom cover essential areas. These four firms’ responsibilities are: economic responsibility, legal responsibility, ethical responsibility, and philanthropic responsibility (Elkington, 1998). The triple bottom line covers the transparency, accountability, and responsibility aspects of firms’ financial, environmental, and social activities.

Strengths of Stakeholders’ Communication

Government’s support to develop the industry emerged as one of the principal strengths of the auto industry in Mexico. For instance, government’s support to NAFTA contributed to enhance the location and low cost advantages of the auto industry in Mexico. At the time of the NAFTA negotiations, Mexican federal government understood the importance of these location advantages and the importance of having preferential access to the United States and Canada. Thanks to this understanding, the federal Mexican government was able to support the auto industry stakeholders’ needs and create the right set of conditions to develop the industry.
Furthermore, Ruiz (2009) explains that Mexican senior government officials consider that NAFTA was a driving force that encouraged the creation and development of national programs for T&D in order to help Mexican national companies be competitive (Ruiz, 2009). At state level, many Mexican states, such as the state of Guanajuato, are actively in communication with private sector. Guanajuato state government is directly supporting the process of selecting new facility location for large multinational company. Because of this close collaboration, Guanajuato State is emerging as a hub and is attracting skilled labour, not only in the auto industry but also in other manufacturing and knowledge intensive industries.

Government’s support to the industry is also reflected in the large and diverse number of bilateral trade agreements. Mexican’s Minister of Economy reports that has 12 free trade agreements with 44 countries and 30 agreements to promote and protect investments (Secretaria de Economia, 2015).

Part of the incentives that the government offers is the relative low taxes in comparison with other countries in the region. The State of Guanajuato is perceived as one of the safest states in the country, which helps to attract more business investment.

**Weakness of Stakeholders’ Communication**

Due to the limited number of skilled, labour poaching is affecting the local labour market. To contribute to solve the poaching problem, the stakeholders are in communication aiming to reach an agreement. One of the examples mentioned is the case of the automotive cluster of Guanajuato and the roundtable meetings to reach a gentlemen agreement between the members. Nevertheless, the main issue of skilled labour shortage remains and a possible solution is to create direct collaboration between the academic institutions and automakers.

Low labour wages become a weakness from the point of view of the local employees. The best local skilled workers perceive the local wages as relatively low in comparison with the United States or Canada, thus incentivizing them to leave Mexico.
It also creates the threat of brain drain for the best Mexican minds, creating the possibility that Mexico can remain in the bottom of the pyramid.

Information regarding the structural capabilities of the industry and the type of activities locally established is scarce. Based on the feedback received from the agencies that represent the different companies of the industry, the main reason of this situation is the lack access to company internal information at national level. Now of the interviews these agencies had on-going efforts to collect this data in order to have better understanding of the macro situation of the industry.

Local second and third tier suppliers face important barriers that prevent them to win supply orders of multinational companies. These barriers include access to capital and production capacity. Production capacity is limited by the access to investment capital. As a result, most of the local suppliers are present in service areas.

**Opportunities of Stakeholders’ Communication**

Despite the government support to attract FDI to the country, concrete public policies and programmes remain scarce and are provided to certain players. In the positive side, at the end of 2014 the Federal Government created a programme to improve the access to support and capital to small and medium suppliers.

National investment in R&D remains relatively low, while most of the multinational companies do not have extensive R&D operations in Mexico. All the companies’ interviews did most of the engineering and design outside of Mexico but the quality checks and validations were done in Mexico. Because of this situation, the opportunity to create programs and incentives to localize R&D activities remains attractive.

**Conclusions**

The different perspectives and point of view of the interviewees were useful to understand their position, knowledge and vantage points. For instance, academics
tended to have a more critical point of view of the industry status, versus the company expatriates and government officials.

Among the limitations of the information collected from the interviews, the feedback from the interviews does not mention following threats to the industry: Dependence on multinational companies, the lack of production capacity to manufacture products for developed countries, and the relative low value of local activities in the global value chain.
5. Conclusions

The dissertation covered the development path of the auto industry in Mexico. Starting from the public policies that helped to localize manufacturing, the state of the labour market, an analysis of key areas of the industry utilizing the diamond model from Porter (1990), and a SWOT analysis to assess key areas of the industry. Finally, the thesis presents the sustainability perception of the auto industry’s stakeholders as a set of indicators related to the four dimensions of sustainability.

The development of the auto industry in Mexico during the past few decades has been positive. Automobile production and export growth support this view. Multinational companies’ desires and interests to establish operations in Mexico further contribute to the competitiveness of the country. Nevertheless, weak areas still exist. Observing the industry from the perspective of the ESEG sustainability dimensions served as a tool to understand the stakeholders’ sustainability perception of the auto industry in Mexico.

Mexican labour market characteristics contribute to the shape of the auto industry and the strategies of foreign automakers. For instance, the relative low availability of skilled workers represents a strong weakness, which forces companies to heavily invest in T&D programs and continuously send Japanese expatriates from their home country, as supported by Shiraki (2007). This situation suggests that companies adapt their T&D strategies depending on the context of the host countries while companies are internationally transferring FSAs and organizational knowledge to host local workers. This process could lead to develop unique host country FSAs and maximize host countries location advantages.

Mexico’s diamond analysis showed the macro structure of the industry. Furthermore, this analysis helps to understand the source of Mexico’s competitive advantages. For instance, it showed that Mexico’s local auto industry remains strongly attached to the North American value chain. Mexico’s diamond characteristics are heavily supported by the United States diamond characteristics, in areas such as parts and components supply and R&D activities. Furthermore, the industry’s high entry
barriers and level of competition prevent new local payers from emerging. In particular, the high entry barriers prevent Mexican indigenous suppliers in participating in the value chain. Nevertheless, as Contreras et al. (2012) shows, progress is being made.

In comparison with China, Thailand and Brazil, Mexico implemented less protectionism policies during the early stage of the auto industry development. In contrast, during the last 20 years, Mexico government signed 12 free trade agreements with 44 countries, which helped to incentivize foreign companies to establish operations in Mexico. Among Mexico’s main competitive assets are geographical advantages; relative low labour costs, and access to develop and developing markets.

China, Thailand, and Brazil seem to relay more on public policies to develop their local auto industries than Mexico. For instance, Thailand’s policies are encouraging investment in green technologies with the expectation to trickledown new technologies into developing markets. On the other hand, Mexico government’s is interested on creating the appropriate macro environment to attract and retain the investments necessary to develop the industry. In general, previous export-oriented policies are affecting Mexico more than Thailand during the current development state of the industry (Perez Debrand, 2014).

In the area of externalities, the growth of the auto industry has been contributing to create negative environmental externalities, such as pollution and traffic congestion. The federal government implemented some regulations to reduce these externalities in the largest cities. Nevertheless, there are no concrete policies to gain competitive advantage in environmentally friendly “green” technologies. In contrast, Thailand created strategic plans and policies to incentivize foreign investment in the area of “green” technologies.

Another negative externality of the liberalisation period is the increasing import of used automobiles from United States to Mexico. The used car market is alternative to the new car market, despite the fact that does not contribute to local production.
Regarding the development process of the auto industry, the public policies to liberalise the industry that were implemented during the 1990s contributed to open the exports capabilities of the country and tap into neighbouring countries. These policies contributed significantly to attract more foreign investment. Mexico is using its proximity to the United States market as a location advantage to attract foreign investment and compete based on lower costs.

Part of the disadvantages of mainly focusing on an export-oriented model is that increases the risk for local production. Furthermore, an export-oriented model increases the dependence of local production on foreign markets, economic relations, and diplomatic relations. The ideal model will be a balanced shared of exports with locally sold vehicles. Rostow's stages of growth model (1959) argues that countries can leverage their advantage on exports to finance the development industries, in the case of Mexico, the indigenous auto industry.

By focusing on penetrating matured markets, Mexico is increasing the dependence on technologies and expertise from developed countries. By continuing this tendency, Mexico is reducing the opportunities to develop local expertise and discover opportunities in local markets. Furthermore, it increases the competition level for the limited number of indigenous companies, which also reduces the number and scope of local activities. To prevent Mexico from only from having low value added activities, it needs to utilize the profits gained from exports and reinvest to address its weaknesses and threats (Rostow, 1959). The fact that most of the companies are foreign; reduces the changes to provide autonomy to Mexican operations.

In the end, Mexico has the risk of staying behind and not reaching the same development level as matured countries. Mexico’s local capabilities should not be only limited to manufacturing and low value added activities, but instead, activities related with research, development, software and design.

Furthermore, the export-oriented model is weakening the internal market because most of the vehicles built in Mexico are for advanced export markets, such as the
United States and European Union (EU). In addition, locally produced vehicles are manufactured with higher technology and safety standards than most of the vehicles commonly sold in emerging markets, such as Mexico. The extra content added to vehicles designed for developed markets leads to higher sale prices, which puts the vehicles out of reach of the poorest section of the market.

The data collected shows the different views and expectations of the stakeholders. Academics tended to be more critical of the status of the auto industry, while associate and company officials tended to be more complacent about the status of the industry.

Public policies such as the 1960s import substitution rules, the Mexico – United States border development program, and the transition to NAFTA’s regional requirements served as key factors that are still shaping the present of the auto industry in Mexico. Nonetheless, these policies also contributed to create Mexico’s current weaknesses. Some of the weak points are the weak internal market, the strong dependence on exports, the limited number of indigenous companies, and the reduced number of local R&D activities. These weak areas are reducing the chances for Mexico of gaining capabilities related with the research, design and development of vehicles targeting emerging markets.

Figure #7: Stages to Manufacture Vehicles for Emerging Countries

<table>
<thead>
<tr>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacture locally vehicles for emerging countries</td>
<td>Localise the design + R&amp;D activities needed to manufacture vehicles for emerging countries</td>
<td>T&amp;D to create the Human Resources and skilled labours</td>
<td>Localise knowledge intensive activities</td>
</tr>
</tbody>
</table>
Mexican overall country strategy has to evolve to take advantage of the auto industry’s structural changes, localize more knowledge intensive value chain’s activities and reduce the skilled labour shortages.

In the long run, Mexico has the opportunity to manufacturing two types of vehicles. One of the vehicles can be tailored for developed markets, while the other can be tailor for developing markets. The cases of Thailand, China, and Brazil suggest that by manufacturing vehicles tailored for untapped markets, such as the developing countries close to Mexico, more R&D activities are also localized. By localizing more R&D activities in Mexico, foreign automakers will need to increase their T&D activities, thus helping to increase the number of skilled labour and knowledge intensive value chain’s activities.

Mexico has the opportunity to take the structural changes of the industry as an advantage and develop a sustainable auto industry. Furthermore, Mexico can avoid making the same mistakes that matured markets did. If the weak areas of the industry are addressed, externalities and post development costs can be reduced.

For future research activities, the author will work to improve the analysis of sustainability perception proposed in this thesis. To gain further access to key corporate and industrial data to improve the overall research, the author suggests performing a longer field research in closer collaboration with the stakeholders of the industry.
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## 7) Appendix

### Auto Industry in Mexico

<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Exports</th>
<th>Imports</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,935,527</td>
<td>1,434,000</td>
<td>402,666</td>
<td>853,775</td>
</tr>
<tr>
<td>2001</td>
<td>1,841,008</td>
<td>1,404,000</td>
<td>472,982</td>
<td>918,835</td>
</tr>
<tr>
<td>2002</td>
<td>1,804,670</td>
<td>1,326,000</td>
<td>538,108</td>
<td>977,558</td>
</tr>
<tr>
<td>2003</td>
<td>1,575,447</td>
<td>1,170,147</td>
<td>591,071</td>
<td>977,870</td>
</tr>
<tr>
<td>2004</td>
<td>1,577,159</td>
<td>1,094,831</td>
<td>680,182</td>
<td>1,095,796</td>
</tr>
<tr>
<td>2005</td>
<td>1,684,238</td>
<td>1,186,346</td>
<td>725,552</td>
<td>1,131,768</td>
</tr>
<tr>
<td>2006</td>
<td>2,045,518</td>
<td>1,536,768</td>
<td>724,425</td>
<td>1,139,718</td>
</tr>
<tr>
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<td>1,613,313</td>
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<td>1,063,363</td>
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<td>600,614</td>
<td>1,135,409</td>
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**Source**  
OICA AMIA AMIA AMIA
<table>
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<th>Production</th>
<th>Exports</th>
<th>%</th>
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<tr>
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<td>1,094,831</td>
<td>69%</td>
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<td>2006</td>
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<td>75%</td>
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<td>2,095,245</td>
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<td>2,167,944</td>
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Source: OICA AMIA
## Auto Industry in Germany

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<th>Sales</th>
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<td>2004</td>
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<td>3,266,826</td>
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<td>3,893,002</td>
<td>3,467,961</td>
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<td>4,303,754</td>
<td>3,148,163</td>
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<td>2009</td>
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<td>3,425,626</td>
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<td>2011</td>
<td>6,311,318</td>
<td>4,240,402</td>
<td>3,173,634</td>
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<td>2012</td>
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<td>4,131,279</td>
<td>3,082,504</td>
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<td>4,197,516</td>
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<tr>
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**Source**
- OICA
- VDA
- VDA
## Auto Industry in Japan

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<th>Exports</th>
<th>Sales</th>
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<tbody>
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<td>1994</td>
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<td>4,460,292</td>
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<td>1995</td>
<td>10,195,536</td>
<td>3,790,809</td>
<td>4,443,906</td>
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<td>1996</td>
<td>10,346,699</td>
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<td>1997</td>
<td>10,975,087</td>
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<td>1998</td>
<td>10,041,958</td>
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<td>4,441,354</td>
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<td>4,715,920</td>
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<td>11,596,327</td>
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<td>2008</td>
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<td>6,727,091</td>
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<td>3,524,788</td>
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<td>2012</td>
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<td>4,572,332</td>
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<td>2013</td>
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<td>4,674,633</td>
<td>4,562,282</td>
</tr>
<tr>
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<td>4,465,624</td>
<td>4,699,591</td>
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**Source:** JAMA
## Auto Industry in China

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</tr>
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</tr>
<tr>
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</tr>
<tr>
<td>2001</td>
<td>2,334,440</td>
<td>-</td>
</tr>
<tr>
<td>2002</td>
<td>3,286,804</td>
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</tr>
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<td>2003</td>
<td>4,443,686</td>
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</tr>
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<td>5,234,496</td>
<td>-</td>
</tr>
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<td>2005</td>
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<td>7,215,972</td>
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<td>8,882,456</td>
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<td>9,299,180</td>
<td>9,380,502</td>
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<tr>
<td>2009</td>
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<td>13,644,794</td>
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<tr>
<td>2010</td>
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<td>18,061,936</td>
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<td>18,418,876</td>
<td>18,505,114</td>
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<td>19,306,435</td>
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<td>22,116,825</td>
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Source: OICA, OICA
<table>
<thead>
<tr>
<th>Year</th>
<th>Production</th>
<th>Export</th>
<th>Sales</th>
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<tr>
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<td>104,502</td>
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<td>409,362</td>
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<tr>
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<td>533,176</td>
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<td>626,026</td>
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<td>703,405</td>
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**Source**

OICA  TAI  TAI
## Auto Industry in Brazil

<table>
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<tr>
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<th>Production</th>
<th>Exports</th>
<th>Imports</th>
<th>Sales</th>
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<td>174,178</td>
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Source: AMIA, ANFAVEA, ANFAVEA
# Brazil's Automobiles Production by Fuel Types

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<th>Ethanol</th>
<th>Flex Fuel</th>
<th>Diesel</th>
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<td>2,940,508</td>
<td>207,262</td>
<td>3,332,611</td>
<td>88%</td>
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Source: ANFAVEA
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<th>Brazil</th>
<th>Mexico</th>
<th>Thailand</th>
<th>USA</th>
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Source: OICA