Production models and strategies, new locations and restructuring of value chains: between incremental and disruptive innovation

Calabrese, G. G.: Internationalization and performance: evidence from the Italian supply chain

The main purpose of this contribution is to present a framework for performance assessment indexes in the supply chain of Italian automotive industry. This contribution starts from the premise that in an increasingly integrated market all enterprises are in effect international; whether or not firms’ activities extend beyond national borders, the environment that tempers strategy, business models and performance is an international one. It follows that support for this argument will already be evident in those regions where integration is advanced, as is the case in the European Union area.

Based on empirical data collected from balance sheets, the paper investigates the relationship between internationalization and performance. It analysis if performance is determined by export intensity and the number of international agreements, but by the ability of firms to gain access to specific markets. Moreover, the article analyses if performance tends to suffer when SMEs internationalize through FDI, a finding that suggests a ‘liability of foreignness’ effect at the outset of international expansion. However, this negative effect can be offset by the international competencies that SMEs develop through intense export activity.

García Pando, F. J., Negrete Martínez V., & Alvarez L.: Trade of car parts in the NAFTA area

Car parts are essential for the automobile industry. The location of production facilities is linked to the location of car assembly plants. The NAFTA (North America Free Trade Agreement) has given way to a significant reduction on tariffs, which has allowed the import and export of car parts under favorable circumstances. Car manufactures have changed their production strategies, which have posed a challenge to their suppliers. They have also taken similar strategies to avoid cost increases. This has also meant the creation of clusters and car production regions after the 2008 crisis.

The aim of this paper is to study the development of the automobile components trade toward the USA market from its commercial partners; Canada and Mexico. The former country is the main partner of the automobile industry in Mexico and in Canada. Due to partnership condition established in the NAFTA, it could be inferred that the two countries participate as such. While developing this document, it was discovered that the specialization areas created in both countries before the 2008 crisis have experimented some changes; some of them can be taken as competition to supply the American market, while others are examples of taking advantage of the capacities and the facilities created before. This means that car part makers are creating new strategies to continue in the market.
In order to carry out this study, the methodology provided by the USITC (United States International Trade Commission) was followed through its Interactive Tariff and Trade DataWeb. Trade Tariffs are studied according to the Harmonized Tariff System, aimed at having a clear view on which components are supplied from each country, the dynamics, and their development. To compare the trade structure of Mexico and Canada, the export similarity index is used.

Klier, T., & Rubenstein J.: Changing distribution and composition of Mexico's vehicle exports

Mexico has become one of the world’s leading exporters of vehicles, as the export share of its light vehicle production has expanded dramatically from less than 20 percent in 1985 to over 70 percent today. This paper documents changes between 2005 and 2014 in the volume of exports from Mexico, the destination of the exported vehicles, and the types of vehicles exported. Information in this paper is derived from several sources of data concerning the volume of each vehicle model produced at Mexico’s assembly plants annually between 2005 and 2014, as well as the number of each individual model exported annually to a particular country.

From Mexico’s perspective, two factors underlie the changing structure of vehicle exports. First, Mexico’s production facilities have become integrated with those of its North American neighbors as part of an enlarged production space. Labor costs may be lower in Mexico than in the U.S. or Canada, but transportation costs to those two markets are higher. Second, trade policies have made Mexico one of the world’s leading exporters of vehicles. Exports are increasing relatively rapidly to regions other than North America.

The principal findings of this analysis include:

• Exports of vehicles from Mexico more than doubled between 2005 and 2014, from 1.2 million to 2.6 million.

• The share of Mexico’s vehicle production that was exported increased from 74 percent in 2005 to 82 percent in 2014; conversely, the share of production for domestic sales decreased during the decade from 26 percent to 18 percent.

• Exports to the rest of North America (the United States and Canada) increased from 940,000 in 2005 to 1.9 million in 2014. However, North America accounted for a decreasing share of Mexico’s exports during the decade, from 90 percent in 2005 (excluding unknown destinations) to 66 percent in 2012, although the North American share did increase to 72 percent in 2014.

• The trade balance between Mexico and the United States has widened during the past decade. In 2005, Mexico exported 701,000 more vehicles to the United States than it imported from the United States (879,000 vehicles were exported from Mexico to the United States compared with 178,000 exported from the United States to Mexico). In 2014, Mexico’s surplus with the United States increased to 1.5 million vehicles, with 1.7 million exported from Mexico to the United States and 157,000 exported from the United States to Mexico.

• The principal region of an increasing share of exports was South America. Exports to South America increased from 3 percent in 2005 to 16 percent in 2012, before declining to 10 percent in 2014. The number of vehicles exported to South America increased from 31,000 in 2005 to 368,000 in 2012, before declining to 250,000 in 2014.

• China also received an increased share of Mexico’s vehicle exports, increasing from 0.1 percent in 2005 to 2.9 percent in 2014. Only 761 vehicles were exported from Mexico to China in 2005, compared to 76,000 in 2014.
• The major carmakers display different regional patterns. Renault-Nissan has a relatively high percentage of vehicles remaining in Mexico. Ford and FCA have relatively high percentages exported to the United States and Canada. VW exports a relatively high percentage to Europe and to the rest of the world (Middle East, South Asia, and Japan/Korea). FCA, GM, and VW account for virtually all exports to China, and FCA and VW account for virtually all exports to Europe.

Reyes, J., Sánchez G., & Martínez M. E.: Relocation strategy of Audi R & D activities: The case of San José Chiapa in Puebla.

Global production dynamics of the automotive industry in recent years is characterized by the relocation of production activities in countries outside the headquarters of businesses, investments have mainly come to developing countries. However, the relocation of R & D does not always emerge with productive activities. Production relocation is not an easy decision, involves significant costs and needs in receiving locations, relocation of R & D is not exempt from this. In that sense, the relocation of both is subject to an international strategy of the company.

An example of relocation of production activities is the luxury automaker Audi car, which belongs to Volkswagen corporate, and will be the first in it’s type installed in Mexico. Audi will produce its biggest global car sales, the Q5 SUV. In that sense, will the installation bring R & D? In this regard, local governments have already made investments with money allocated to science and technology in Mexico, this money supports the installation of the company with the creation of The Training Centres for the human resources of the firm. In that sense, it is worth to asking, Does the Audi company strategy includes a relocation of R & D activities? and if so what degree such relocation occurs?

To answer this, the paper presents the analysis of the strategy of relocation of both, productive and R & D activities of Audi, considering it’s needs in three areas: market, production and technology (knowledge). Thus, the work aims to analyze strategies Audi in terms of R & D, focusing on the criteria on which to perform their R & D in a context of global production activities. For this, the document is divided into four sections: the first is a review of studies on strategies and criteria for the location of R & D by transnational corporations, with special emphasis on those that are part of the automotive industry; In the second, productive, commercial and research Audi structure in a global environment is analyzed; In the third, the conditions under which Audi is installed in Mexico, and the country's position to the automotive industry are exposed; Finally, considerations are presented.

Calderon, O., Robles A. C., Salcido González R. S., & Estrada Cerón B. A. : Inclusive development is possible, based on the Automotive Industry? The experience of the plant VW / Audi in the state of Puebla. Mexico.

The automotive industry in Mexico has grown significantly in the last two decades (2015, automotive exports accounted for 23% of all exports from Mexico, according to the report of the AMIA 2016). The Mexican government through the Development Plan 2013-2018, has set a policy of economic development, particularly in strategic sectors with capacity to generate economic growth, employment generation with a comprehensive vision where they take into account the protection of natural resources, education, citizen participation, among others. But all these measures do not mean that translate into a comprehensive development of regions where new auto plants are installed; starting from the government to buy at a low price the land where new industrial developments were installed.

This paper analyzes what is happening in the municipality of San José Chiapa and Nopalucan in the state of Puebla from the beginning of the activity of the plant AUDI, based on the application of a representative survey of social indicators in the municipalities of San José Chiapa and Nopalucan. The data obtained were worked in SPSS and have important conclusions about the project's inception VW / Audi, economic growth is starting in the region and the social problems that are being developed.
Lee, J.: Growth Strategies of the Mega Auto Part Suppliers in Japan: A comparison of Denso and HAMS-

This study aims to investigate how the trajectories of Japanese large sized suppliers’ strategies differ depending on capital relationships, from the perspectives of the customer, the product, and the core competence. In this study I compared Denso who is a capital Keiretsu supplier with Hitachi Automotive Systems (HAMS) who is an independent supplier in the multiple field of auto parts, in terms of the growth strategy three axes; product, market, and core competence. I focused on these two companies’ R&D of automatic brake system. As a result, I found that Denso is successful in terms of economy of customer scope, on the contrary HAMS is more dynamic in the new combination oriented innovation.


This study examines the performance from 1980 to 2014 of Japanese automakers that make passenger cars and light trucks and compares their performance with that of their Western counterparts, including premium European (German) automakers. The inquiry focuses on market competitiveness, which according to the academic literature is reflected by the relative performance of a company’s products in the market. Market performance exerts significant influence on profitability, which is the reason why this study also investigates the profitability of Japanese and Western automakers.

The data used in this study was collected from publicly available sources: corporate financial statements and annual reports from 1980 to 2014. The measure used to estimate market performance consists of two indicators: market share and brand value. Market share is commonly used in business research as a proxy for market performance. We have attempted to deepen our measure of success in the market by incorporating a rough measure of brand value that allows us to take into account the fact that a luxury vehicle and a mass-market vehicle have very different price points and profit margins. As for profitability, the indicator chosen for this study is the operating profit ratio because it is generally held to be the best measure of the profitability of the core business of a company.

Our findings indicate that Japanese automakers show continued success in market performance and that in the last decade they have established a firm link between market performance and profitability, with some Japanese automakers reporting record operating profit ratios. The discussion focuses on the future challenges that the Japanese automakers need to meet and attempts to project their future performance in the context of the increasingly global automotive industry and the "do more with less" strength of Japanese automakers.

Smitka, M., & Warrian P.: From commodity to high tech: steel as a new player in the automotive supply chain

Steel was once a commodity purchase, with only weak links between mills and assemblers. Meanwhile, automotive companies faced an imperative to reduce weight while improving safety, which led to the introduction of an array of new materials and related engineering knowledge and manufacturing techniques. Steel looked like it might be displaced. That did not happen. Over the past decade advances in materials science allow steel firms today to manipulate the alloying and crystallization process to develop totally new types of steel. They now work with vehicle manufacturers from the earliest stage in the engineering of a new vehicle, playing a direct role in the development of the frame design. They likewise work closely with suppliers on new manufacturing technologies that allow the forming of these new steels. They thus supply a high value-added product and related services, not a commodity. This paper traces this process as one example of the impact of the ongoing materials science revolution that has brought new players into the automotive chain, while revolutionizing the role of suppliers such as steel firms.

Micheli, J., & González G.: Automotive Industry and urban crisis: A window of opportunity for Mexico?
Since 2009, Mexico has produced 153 thousand vehicles in average each year, positioning it as the seventh biggest automobile producer worldwide. The investment announced in recent years (starting at 22 billion dollars) anticipate a production of 5 million vehicles in average by the year 2020, number that would place Mexico on a production level in between Germany and South Korea. This exponential increase in capacity of the industry plays a decisive role in the current environmental problematic, this subject can’t be detached from the critical conditions in which Mexico is, as a society facing a sustainability crisis, specially urban. From 2005 to 2013 Mexico City went from 3.5 to 6.8 million cars, in the next 6 years it’s estimated to reach 14 million cars if the increase is steady.

Mexico’s productive platform is oriented to internal combustion cars, the traditional tech scheme “pre- peak oil”. Mexico is home to almost every big player in the traditional industry, but not the new ones which are transitioning to a new paradigm of sustainable mobility. Under the current techno-politic and industrial principles, there’s not a clear course of action towards a new automotive industry, with R&D and significant resources. This quickly causes a paradoxical gap, where the national markets that requires a new offer of automobile goods, still bounded to expand to its limits the old model. The only character that can reverse this paradox is the Mexican state, since decades ago, linchpin of the neoliberal establishment.

The context in which is possible to move to a new production model is the urban. Cities have a strategic place in globalization: most of the globalization processes take place there, and in countries like Mexico, that has a strong economic and politic centrality, urban dynamics have national impact. We will analyze the legal framework of the urban dynamics on the subject of sustainability, as well as the possible politics on the subject of energetic transition. We want to propose a new possible model which contains regulations and an institutional framework oriented to the national production and active promotion of consumption of automobiles with new technology. We want to prove that it’s possible to initiate a process, within the cities, like Mexico City and Guadalajara, which can unify in a virtuous cycle of new developments, whether it is production capacity or urban necessities, in a country with worldwide weighting in both extremes: production and consumption.

**Castellanos, J.:** Role of industry automotive installed in Mexico in the struggle for markets starring major global vehicle manufacturers

The aim of this paper is to show a balanced picture of the importance of foreign investment in the automobile industry installed in Mexico, because the spokespersons of the Mexican government and automotive companies, automakers and auto parts, in all communications presented encouraging results taking into account the high amount of exports of this industry, which exceeds the oil greatly.

In this context, no longer deemed exports mainly benefit companies that perform, not the country. The only benefit of automotive investments is the hiring of well paid if compared to wages in the country work, but precarious if the comparison is with the wages of workers in countries where companies have established their headquarters. In addition to the explanation of these facts, it also concludes that the investments made by the industry, are less than half of the profits obtained in Mexico by the fact that automotive manufacturing in the country.


Automotive production-relocation in the NAFTA region after the 2008 crisis is analyzed at different levels, including automobile unit-production changes in the regions within a country, at the assembly-plant level and in the product portfolio. We compare production for two different years: 2007 when the crisis began and 2015 when the consequences could be observed. Based on information relative to where plants are located, year of establishment, firm ownership and production, we defined five regions: two in the US two in Mexico and one in Canada. These regions were
classified as “traditional” and “emergent” spaces. Results show that the age of each assembly plant was not a factor for restructuring.

Between 2007 and 2011 traditional spaces in Mexico were the most favored but four years later the emerging region grew (44.26%) while the traditional one only grew (29.71%). Most of this growing was concentrated in Guanajuato, a state with five assembly plants. At the same time the traditional spaces in the USA were adversely affected but six years later it recovered its production to the same levels it had in the beginning of the crisis and the emerging zone grew more (10.51%) than the traditional one (-5.02). Canada decreased production by 400 thousand automobile units but still remained as the country with the best Economies of Scale and manufacturing cars with high added value. Canada was the only country that launched more new models than it stopped manufacturing. Canada decreased its production by 7%, closing the Ford Plant in St Thomas and opening the Toyota plant in Woodstock. It also stays as the country with the highest average production per plant. Finally, in these years the Nafta region shows a full recovery of production and average yield per plant.

Daville, S.: Crisis, restructuring, and local configuration of the car industry in Mexico's federal district, 1993-2010

From the 1990’s on, and specifically from 1994 when the North American Free Trade Agreement (NAFTA) came into force, the policy of reorienting the Mexican economy toward the outside world was stepped up and trading competition increased. The automotive industry in particular has gone through significant transformations, both in regard to modernization and territorial relocation, in order to face this process. This paper discusses the changes that have been taking place in the automotive industry established in Mexico City and their territorial deployment, based on the existing statistic data from the Census and survey evidence from the industry companies.

Chen, Y., CHOWDHURY S., Donada C., & Perez Y.: Mirroring Hypothesis and Intergrality in the Electric Vehicle Industry: Evidence from Tesla Motors

Although auto industry and its original equipment manufacturers (OEMs) have pursued vertical integration to an extreme level in its early history, the strategy seems to have lost its traction since late 1980s. One main contributor to this change, according to research in organizational economics and strategic management, is outsourcing and its consequence on the evolution toward more modular product architectures (Frigant, 2011; MacDuffie, 2013). This relationship between the degree of vertical integration in an industry and product architecture comprising integrality and modularity is presented as the “mirroring” hypothesis in the literature (Argyres & Bigelow, 2010; Baldwin, 2008; Colfer & Baldwin 2010; Sanchez & Mahoney, 1996). It suggest that vertical integration of component products in the upstream and downstream operations of the firm is associated with integrality of product architecture (“where the product results from the assembly of physically interdependent or multi-functional subassemblies, and/or whose interfaces have been decoupled” (Frigant, 2011: 326)). Conversely, the outsourcing strategy of firms is associated with the modularity degree of products.

Electric vehicles (EV) is considered as a radical innovation in today’s automobile industry. EV has challenged current automobile product architecture, as it involves new components inside vehicle (e.g. battery and electric motor) and sets a new ecosystem that require the commitment from electricity and recharging system. The growth in EV market and changes in EV architecture prompted us to examine two interrelated questions regarding the mirroring hypothesis: 1) have architectural product changes in the EV industry shifted towards higher levels of integrality?; 2) does the product architecture of the EV mirror its OEMs’ vertical integration strategy? This proposal is intended to answer these questions.

In the search for a dominant design, two approaches are evident in the EV industry. On the one hand, most incumbent auto manufacturers define the architecture of their EVs by minimizing changes in their existing production infrastructure, capabilities, and network of external partners. In its most basic form, automakers refit existing conventional car models with electric powertrains. The alternative is a purpose-designed EV. This radical strategic
choice involves a completely new design with an idiosyncratic architecture dedicated to the battery and range anxiety issues. This architecture leads to the production of specific modules and components. It also pushes the boundaries of the automotive industry by mandating an alignment of the interests of various stakeholders in the EV ecosystem.

We focus on purpose-designed EV to highlight the mirroring hypothesis. We analyze a single in-depth case study on Tesla and its flagship Model S. Two considerations contributed to Tesla’s selection: 1) its dedication to purpose-designed EV allows us to study their architecture-organization relationships; and 2) its influence on the EV industry as a relatively successful player in the EV ecosystem. Following the literature of modularity and integrality in product architecture (Ulrich 1995; Ulrich & Eppinger, 2000; Fixson, 2005), we study the integrality level of Model S according to i) the mapping from function elements to physical blocks; and ii) dependencies on interfaces between blocks. Key blocks and their interfaces in EV system are identified in Figure 1. We capture the coupling characteristics of interfaces by the product Design Structure Matrix (DSM) map (Baldwin & Clark, 2006). Our approach generates theoretical insights from a single in-depth case (Yin, 2013) based on qualitative data on the supply chain relationships of Tesla and its product architecture. Data collection covers the period from June 2011 (Tesla went public) to June 2016.

Our initial findings shows 1) Tesla designs its Model S, its battery pack, the charging interface (plugs and IT) and a fast-charging Supercharger simultaneously for coupling interfaces and ‘one to many’ mapping which, in turn, increases the integrality of the product. It calls for the right level of vertical integration as a result of more transaction costs caused by the opportunism risk, asset specificity, and potential hold-up situation. 2) Tesla’s focus on the density (defined in terms of easy availability and quantity) of the charging network has no direct impact on the integrality of the Model S. However it calls for the right degree of vertical integration. This alignment between the components of the Model S and vertical integration demonstrates the mirroring hypothesis of integrality in the case of Tesla.

Our work contributes to the body of knowledge on the mirroring hypothesis of integrality, which was hitherto unexplored in the literature. To the best of our knowledge, only one study (e.g., Fixson & Park, 2008) explored this issue and called for other research on other industries for additional insight. Our research will contribute to this end. Our research calls attention of OEMs to a new meaning of product architecture and make-or-buy question in EV industry: a) our research argues with previous studies (e.g., Cabigiosu, 2013; Christensen, 2011) on EV architecture, which are focusing on refitted EV and conclude that EV is becoming more modular. We argues that the refitted EV industry may indeed become more modular, mainly because the rest of the architecture is already in place. This conclusion might not be true for purpose-designed EV. Contrariwise, the case of Tesla shows that a radical change in the architecture of the BEV leads to a higher level of integrality. b) As EV is still in the emerging phase of the industry lifecycle, the strategy of vertical integration may play a key role in the success or failure of the incumbents or the new entrants. The mirroring hypothesis of integrality may make innovation of Tesla’s architecture novel and preemptive so that it can shape the structure of the EV industry. c) This research highlights the dynamism of the integrality-modularity sequence in the EV industry. At the beginning of the industry, the integrality of the product resulted in a high level of vertical integration. Over time, the drive for outsourcing may lead to modularity in the product architecture. This allows us to offer a new proposition for further research: When reduction of costs becomes an imperative for the OEMs in a mature EV industry, more modularity may appear.

Barassa, E., & Consoni F.: Potential development of electric vehicles production and market in Brazil: a discussion focused on automotive and electric sector strategies

The automobile industry across the world is undergoing structural changes (Jullien & Pardi, 2013). Advances in emission regulations and the effects of oil price fluctuations are forcing carmakers towards new product programmes that use new technologies in order to increase the energy efficiency of vehicles, reduce emissions and decrease environment impacts (Freyssenet, 2011). Among the technological paths for the automotive industry in this context, the electric vehicles (EVs) - Battery Electric Vehicle (BEV), Plug-in Hybrid Electric Vehicle (PHEV), are highlighted as alternative solutions to internal combustion engine vehicles (ICEVs). Most of trusted automotive industry forecasts argues that electric mobility will become established (IEA, 2015; Navigant Research, 2015). The number of electric
vehicles produced and marketed have increased consistently over the past few years. However, this is a transition path that is taking place slowly, gradually and differently among countries with consolidated automotive markets and industries. Automotive companies, especially in emerging markets, are faced with the decision of either attempting a leap into electric mobility, based on innovative business models and new technologies or continuous improvement of traditional business models and existing technologies (traditional internal combustion technology) (Proff, 2011).

Bringing this discussion to the scope of the Brazilian automobile industry, some questions arise: Does Brazil plan to enter into the segment of electric mobility? What is the role being designed by the automotive industry and the electric sector? Does the country intends to invest in diversification, working both with flex fuel vehicles as well as electric?

The paper explores these questions by discussing the strategies and actions performed by the automotive industry and electric sector in Brazil to promote the formation of an EV production cluster and local market. In order to achieve the proposed objective we use a combination of two strategies: first, mapping and collecting secondary data on the topic of electric vehicle production and supply chains through literature search (articles, theses, books and technical reports). The second strategy involves the application of semi-structured interviews conducted at large automotive manufacturers and global suppliers, at industry associations, consultancies as well as with academics, throughout the period comprehended between September 2015-February 2016 in São Paulo state/ Brazil.

The results of this study show that Brazil does not have a clear and defined strategy for the development of electric mobility. There are ongoing specific actions taken by some actors. The main projects about EV’s R&D (Research & Development) and production are being conducted by electric sector companies (electric energy generator and electric energy distributor), namely: (1) developing studies related to the impact of EVs on the electric grid; (2) developing prototyping projects of EV’s; (3) identifying the needs of potential users and (4) negotiating incentives and subsidies with the federal government and automotive industry. As examples we can emphasize the partnership between ITAIPU - the largest hydroelectric power generator in Brazil - with FIAT, for the development and production of the electric version of the Palio model. CPFL (São Paulo Electric Company) is conducting R&D projects with public research institutions like Center of Research and Development (CPqD) and University of Campinas (UNICAMP). CPFL is also installing electric charger stations in Campinas and surrounding areas. From another perspective we identified some actions from automakers and auto parts installed in Brazil in favor of the electric vehicle. However, these initiatives perform a modest participation if compared to the electric sector. Foreign automobile manufacturers are starting the commercialization (mainly for private companies) of imported electric automobiles in the domestic market. As examples we can mention the commercialization of the BMW i3, Nissan LEAF and Renault ZOE in 2015. However, due to the high price of these vehicles, few units were sold so far - around 4,000 units - (ABVE, 2016). Until now there is no production of electric automobiles in Brazil, but this situation may change with Nissan. This Japanese automaker is considering the installation of a new plant for the production of LEAF in Rio de Janeiro in 2017. The survey also identified small technology-based companies (start-ups) that manufacture bicycles, tricycles and other small cars. We highlight the role of the bus segment, which presents the national company Electra as assembler and the newly arrival of Chinese BYD, with a production plant for electric bus and batteries in the city of Campinas. About components, two companies have been identified: WEG (electric motors) and Moura (batteries) demonstrating the fragility of the formation of a supply chain in the country, since there are few companies manufacturing components.

We conclude that Brazil does not have a comprehensive and well-defined strategy directed to the development of electric vehicles. Mapped ongoing actions do not have the strength or the coordination that is needed to promote the formation of an electric mobility cluster and local market. We can argue that Brazil is positioned in favor of maintaining its auto industry based on ICE’s that uses renewable fuel, a field that the country has more than 40 years of experience and accumulated know-how.
Lacayo, H., & Juárez J.: Main technological strategies of the world automotive industry to reduce air pollution caused by the use of the automobile: Restrictions for their use on the Mexican market

According to the International Council on Clean Transportation (ICCT, 2012, p.1), half of the world consumption of oil and a quarter of the greenhouse gas emissions in the world, are due to transport activities. This sector, which includes passenger vehicles, trucks, train, sea and air transportation, keeps on growing rapidly. So it is necessary to establish transportation policies in order to prevent the number of oil motor vehicles from duplicating in the next twelve years (ICCT, 2012, p. 1) and the increase of greenhouse gas emissions.

Many governments have committed to reduce the proportion of the activity of automotive transport in passenger automobiles and also improve public transport systems. Also, there has been a progress in some countries and cities around the world by changing to less polluting energies for the automobile and developing eco-efficient vehicles.

In Mexico, road transport activity has doubled during the first decade of the 21st Century and it is expected to grow up to 75 % by year 2030 (ICCT, 2012, p. 72), due to the absence of measures that contribute to efficiently reduce the use of the passenger vehicles. Furthermore, Mexican average vehicle fleet age has passed from 15 years in 2008 to 17 years in 2012 (Lacayo & Juárez, 2015, p. 9).

The aim of this work is to analyse the main technological strategies carried out by the world automotive industry to reduce greenhouse gas emissions caused by the use of vehicles and to point out the obstacles to generalize such solutions in the Mexican market.

In order to reach this objective, we will first present the evolution of Mexico as a vehicle producer and its vehicle internal and foreign markets. Secondly, the greenhouse gas emissions caused by several sources will be presented. In addition, the aging of Mexican automobile fleet will be analysed. Finally, the technological solutions implemented by the world automotive industry to reduce greenhouse gas emissions as well as the obstacles for its widespread use in the Mexican market will be discussed.

Galan, F. C., Peralta R. T., & Covarrubias A.: A review of challenges for the electric car adoption in México

Air pollution is a major concern in most populated cities in México. The introduction of a Zero Emission Vehicle (ZEV), or a plug-in hybrid, on these population centers could help solve the problem, but it is necessary to address some issues that make it difficult to implement a widespread deployment.

We review the most urging obstacles that arise, like the high cost of the ZEV’s and hybrid vehicles. Also, there is lack of infrastructure for Electric Vehicles, as only a small number of public charging stations exist and the national electric grid lacks the capacity to support the insertion of large number of EV's into public roads. Another factor to add is that México is a major international manufacturer of Internal Combustion Engines (ICE) vehicles, so this is a negative incentive to transition to ZEV’s.

Even if all these hurdles are overcome in the short term, there is a big obstacle ahead: the lack of the mexican federal government support to EV’s and hybrids vehicles. While countries like the USA, and the majority of countries in the EU give tax incentives to owners of ZEV’s, and in some places there is a tax refund for purchasing a ZEV, in México there’s no such program.

Mishima, K.: Strategies for Promoting Motorcycle Industry Development in Bangladesh

1. Purpose
What are the things needed for developing the motorcycle industry in Bangladesh? This presentation is intended as an
investigation of the finding ways to promote development of the motorcycle industry in Bangladesh. There are a variety of policy options to develop the industry. Above all, a choice may need to be made on whether to focus on the overseas market or the domestic market (whether export-oriented or import-substitution). No country in history has achieved success in the export of motorcycles from the beginning of the industry development stage. All countries followed a process of development that is supported by success in the domestic market. It is believed that achieving export-oriented success from the beginning of the industry development stage is unlikely. This is because the existing competitors are already there in the global market and have competitive advantages. Therefore, the motorcycle industry in Bangladesh would have to follow the import-substitution development process. What is needed for the policy of import-substitution industry development is expansion of the domestic market. This is definitely of crucial importance. For export-oriented industry, the size of the domestic industry is not restricted by the narrowness of the domestic market.

2. Design/methodology/approach
In the emerging markets like Bangladesh, considering the various phases of each industry, one comes across two major research trends. One is examining the ability of MNCs to transport and utilize their organizational capability. Some studies have considered the competitive advantages of MNCs from the perspective of architectural and organizational ability. The other trend is to focus on local firms’ original business pattern and managerial environment. Also this presentation is based in a case study designed to gather evidence on firms within the supplier network in the motorcycle industry led by Indian firms, Japanese firms, Chinese firms and local firms in Bangladesh.

3. Findings
We shall discuss characteristics of the motorcycle industry in Bangladesh from the consumer perspective. Bangladesh’s annual sales of motorcycles grew to the 200,000 to 300,000 level. However, the market size started to shrink due to the government policy. The Price of Bangladesh motorcycles was high (about two times that of India). One of the reasons for the high price was high customs duties (Semi-Finished part at 59%, CKD at 89%, CBU at 131%).

Up until 2010, importing CKD and assembling them at a plant in Bangladesh was the mainstream business form. However, after 2008 when the market expansion became real, companies that perform production (to be discussed later) not only performing the assembly work have started appearing in the market. The motorcycle sales price is high in Bangladesh, almost twice as much as in India. In order to achieve further expansion of the market, it is believed that lowering the sales price is essential. Considering the market size, Bangladesh’s motorcycle industry is currently in the phase where the localization has begun, although it is limited only to the assembly of complete build-up vehicles. Furthermore, in addition to such progress in the localization process, withdrawal of merger of Hero and Honda and their separation in 2011 has caused a significant impact on the motorcycle industry in Bangladesh. This is because the separation resulted in a sudden decrease in the number of sales of Atlas, which held the top market share in the industry, and nearly ruined the company. Uttra, which sells Bajaj’s products, has taken over the number one position from Atlas. However, Uttra’s management is not really stable, because Bajaj is believed to be planning on starting independent operation in Bangladesh by constructing their own plant.

Turning now to the view of suppliers, these components were provided by two types of companies, (1) nine assembling companies and (2) two manufacturers. In Bangladesh, localization is progressing as the market expands. Localization was implemented by manufacturers who imported parts and materials from China with their technical support. On the other hand, assembling companies which imported CKD and specialized in assembling process were on a long-term declining trend. Manufacturing companies that have started to appear the industry in the past five years have been actively making
investments for the purpose of achieving local production. As one of the characteristics of Bangladesh, the companies exploring the local productions are dependent on the technologies and brands of China-based companies. However, the stagnation of the market condition and weakness of the brand power are believed to be the causing factors for the decrease of the production rate. Japan or India-based local production is getting behind.

Based on the above consideration, how can Bangladesh develop its motorcycle industry? There are two political options. Firstly, Bangladesh has three options of China, India, and Japan, which is different from the case of Southeast Asian countries, where Thailand had one and Vietnam had two. The Bangladesh government should aim to reduce a development period by leveraging three options through intensifying competition and diversification. Secondly, the Bangladesh government should improve the competition environment not only for price competition but also by enhancing organizational capacity to compete with competitors. Since the diversity of competitors is one of Bangladesh’s characteristics, it has ample potential for rapid expansion of the market, like Vietnam. Hence, in the beginning, localization starts with labor-intensive and low added value processes such as assembling finished motorcycles. However, if the market continues to expand, local production will gradually progress and localization of high added value process and parts and materials that require technologies will be promoted. In the first place, it is necessary to build capacity of mass production at a certain quality, at a certain cost, and on delivery time.

**Orihashi, S.:** Capability Building in oversea subsidiary - Comparison between first & second generation of IMV in Thailand

Toyota Motor Corporation launched its second generation IMVs (International Innovative Multi-purpose Vehicles) in 2015. First generation IMVs were launched in 2004, with its core manufacturing hub in Thailand, and sold more than five million vehicles worldwide (as of 2012). All IMVs were produced and sold outside of Japan. IMV was the first model series for Toyota that is never produced in Japan. Until then, Japanese multinational automotive manufacturers, including Toyota, have produced and sold only derivative products in overseas. First generation IMV has been regarded as a successful project.

Carrying out this project (first generation), needless to say, Japanese employees (both expatriates and business traveler) continued to play core role, including the chief engineer; while all their production was outside of Japan. However, non-Japanese employees, mainly Thai nationals, also played certain role. This experience contributed to their upskilling very much. (Orihashi, 2008)

Since then, Toyota established regional headquarters of manufacturing and engineering function in Thailand, called Toyota Motor Asia Pacific Engineering and Manufacturing Co. Ltd. (TMAP-EM) in 2007. (Technical center in Thailand, Toyota Motor Technical Center (Thailand) Co., Ltd., commenced its operation in 2005, and it merged existing engineering department of Toyota Motor Thailand.) Toyota have experienced several model changes and new model launches of passenger cars, all of them were derivative products though.

Then, “Toyota Thailand” (This includes both Toyota Motor Thailand and TMAP-EM) headed to second generation IMVs that put into sales in 2015. I would like to investigate capability building at Toyota Thailand in the past decades through comparison between the two generation IMVs projects. I performed several interviews about the first generation in 2000s as the part of my PhD thesis. I will perform interview with key person about the second generation IMVs in March, 2016. I will look into both engineering and manufacturing dimension.

**Chiu, L.:** Massive recalls in the automotive industry : using quality noms and Six Sygma methodology to preserve reputation
The automotive industry throughout the years has seen the result of design failures which result in massive recalls, fatal crashes for the victims and high costs in compensation debt to victims, law suits and loss of reputation for auto makers such as Toyota, GM and Honda (Bloomberg, 2015, DeMeter, 2012, General Motors, 2014 and NBC News, 2014). For more than two decades, Mexico’s companies and automakers, have enrolled in the process of certifying their processes in quality norms based on International Standards, such as ISO 9000. Notwithstanding, although most organizations comply with this certification requirements, few have managed to elevate their quality levels and produce products defect free (Miranda, 2007). Although there are different quality tools and statistical methods, to control quality, it is clear that these are not providing the expected results. Organizations that use Six Sigma methodology do apply a wide variety of quality tools in their projects, but less than 50% of these have had a significant financial result (Johnson, 2009; Yudi y Osada, 2010).

The research question of this study to be found, was there a significant relationship between: the use of quality tools and their mathematical level of the multinational companies that produce auto parts in Cd. Juarez, Chihuahua? This research attempts to answer which are the Six Sigma quality tools used and the level of mathematical difficulty in different auto parts organizations in Cd. Juarez, Chihuahua Mexico. An exploratory, non-experimental, quantitative, correlational and transversal study was performed. The populations under study were men and women that work in medium multinational sized companies. Participants were chosen that had experience implementing Six Sigma, process experts and employees in the areas of quality, production, and engineering. Participants such as Black Belts, Green Belts were included. A convenience sample was used for this study since the researcher had no direct access to the enterprises. Engineering students from the Technical University of Ciudad Juarez facilitated reaching out to the companies since they perform a four month internship.

This study was performed during the whole year of 2014. The results of this study would not be generalized to the whole population, since it was not chosen at random. The results showed there exists a significant relationship between the use and the degree of difficulty in mathematics of Six Sigma quality tools, the Chi square Pearson value was equal to 6,452 with a value of \( p = 0.011 \). The Six Sigma quality tools that are most used do have a high degree of difficulty more than the ones that are easy to use in a 30% to 15% respectively. With an alpha value of \( \alpha =0.05 \), and the \( p \) value of Chi Square of Pearson 0.011 which is less than 0.05, then there exists a significant relationship between the degree of mathematics and the use of Six Sigma quality tools. The Six Sigma tools used to improve quality may enable organizations to choose those that are most effective to improve their quality level and at the same time produce significant financial results.

**Melgoza, R.:** Automotive quality failures “recalls” in major manufacturing companies and its relation to quality systems.

This research presents an analysis of recurring errors massive quality "recalls" in major assemblers brands of vehicles have been increasing in recent years affecting sensitive assemblers and the relationship this mistakes have with quality systems have been implemented in the various suppliers of different levels Tier 1 and Tier 2 The document analyze whether these failures are errors of design or failures in the manufacturing process from suppliers or assembly plants.

An historical analysis of automotive quality failures in the last 10 years have caused assemblers call review to vehicles to modify the original components with the consequences that this generates in the image of the brand is done, likewise be revised if there is any correlation between the financial performance of the major assemblers and quality of mass failures they have occurred in the last decade.
A review of the different processes quality certification in auto plants and the various members of the supply chain and the different quality systems that have been implemented in these companies to determine is whether the flaws are in the process manufacturing or quality failure is in the design of the part or the part that caused the spill of quality in the assembly plant.

**Gomez, W.:** Production models and productive restructuring in Mexican automotive industry: Ford Motors Company

The 2008 global economic crisis had serious financial, economic and social effects in both national and international aspect. This research purpose is to elucidate the crisis effects on Mexican automotive sector terminal industry centering on Ford Motors Company and the changes that have taken place in terms of their productive strategies and labor relations.

Particularly, we analyze the Ford Motors Company's behavior that overcame a path of economic losses and undesirable world market positions since the late twentieth century and early twenty-first at the time that increased its participation in Mexican and Latin American automotive industry. One of the essential factors is related to the productive restructuring of the outdated Cuautitlan Izcalli plant located in Estado de Mexico (a region that has a wide industrial and automotive tradition).

The restructuring of the plant is planned before the crisis and starts to operate in 2010. In response to the cutthroat competition that Japanese automotive companies maintain, Ford Motors holds most of its production in North America, being this the best market. In the last two decades, the company has adopted a transregional strategy by integrating local networks from different regions of the world and consolidating global productive platforms, coordinating, thereby, its intervention with a global perspective of its productive operations, thus participating in various projects and modalities in joint collaboration with other automakers. Due to that, our research aims to enlighten the impact of the restructuring process that had the company since the arrival of CEO Alan Mulally and the way it articulates in their production models and the management of labor relations in Mexico and more specifically in Cuautitlan plant. Additionally, we also remark the changes, the relationship, and the parallelisms between Cuautitlan and other company's assembly plant in Mexico located in Hermosillo, Sonora, in the north of the country, which maintains one of the highest quality and productivity standards of the company in the world.

In terms of Productive Model, we try to locate our research in the convergence-divergence productive discussion to determine whether the same corporate automaker maintains a similar trend in work organization, product policy, technological standard, and labor relations.

The procedure for conducting this research was implementing a quantitative and structural analysis of the automotive industry and the Ford Motor Company; besides, the central perspective starts from the analysis in situ in both factories: Cuautitlan and Hermosillo, collecting empirical information by conducting interviews about strategies, decision makings, labor relations, and work processes.

Among the principal conclusions, we found an increasing on flexibility in terms of labor relations which are limited according to union agreements of each plant; moreover, a gradual loss of bilateralism is evident because all the procedures are determined by the company; and finally, there is a trend to increase the technological pattern towards automation to achieve better control of the work process, better quality, and more productivity, which impacts on the skills and expertise of automotive technicians.

**Mordue, G.:** Enduring Public Policy Lessons from Automotive Foreign Direct Investment in Canada
During the 1980s the Canadian automotive manufacturing industry was transformed. It shifted from one where four American headquartered companies produced 98 percent of the vehicles built in Canada to one with a much more internationalist outlook. During the decade five new companies entered the Canadian automotive manufacturing landscape with new final assembly operations. Had these companies not entered the country, the industry that exists in Canada today would be dramatically different: smaller, less international in scope, less capable of supporting the cluster of automotive parts makers that has evolved. While existing literature effectively captures the preconditions for the changes that occurred during this period, the actual outcomes and the processes associated with those outcomes has received scant attention.

The relative success Canada enjoyed in winning automotive assembly Foreign Direct Investment (FDI) in the 1980s might cause one to assume that the process was guided by a clear and disciplined strategy, progressing from one success to another. However, the cases revealed here show that the process, the tools and the messages emerged mainly from circumstances and conditions to which policy makers and other actors responded in the moment, rather than through a well-defined and forward-thinking program. Even though there can be no question that significant success ensued, closer study reveals that dead ends were met and disappointment occurred.

This paper focuses on those disappointments. It will be shown that rejected overtures provide valuable context and rich insight as they better speak to the challenges and hurdles that actors confront in attracting FDI. Such cases provide the basis for improved understanding about the process of setting policy goals, interpreting the motivations of partners, how major decisions are sometimes made and the capacity of exogenous factors to affect the best laid plans.

The original intent of this research was to review the range of investments that occurred during the period under study. However, during the process of tracing the antecedents and policies incumbent in creating the conditions for the five new final assembly plant investment to proceed, new aspects emerged. They include these previously hidden stories of failure, of opportunities missed and of advances recoiled.

There are many reasons why business histories avoid the study of failure. For example, with the passage of time, a natural tendency exists to focus on what is – or was – tangible or real. A factory that never existed does not normally stimulate research about why it was never built. Second, many of the unfulfilled investments that were considered did not generate attention at the time. Investors then, as now, are much more comfortable announcing tangible plans than vague prospects. Third, investments that were considered but rejected can in many cases be considered failures and actors are reluctant to discuss those. Fourth, with the passage of time, awareness of these unanswered propositions becomes less visible. Finally, on a very practical level, the fact that these investments were never made means that access to informants is inherently more difficult.

Primary research for this came from two key sources: interviews with key actors and government archives. To that end, 17 direct participants from the era were interviewed. As well, the archives of the Government of Canada and the Province of Ontario revealed new information about the process, the actors and the tools.

The rebuffs started in the late 1970s and continued throughout the period when new entrants were announcing investments in the mid to late 1980s. They came from automakers headquartered in the United Kingdom, in the US, in Russia, in Italy and Japan. While it might be convenient to suggest that policy makers reflected upon the missteps, leveraged the rejections and adjusted their approach to prepare for subsequent opportunities, the reality would appear to be far less sanguine. From this, a range of policy implications arise. Some are specific to FDI attraction. Most have broader application.
First, we are reminded that the process of coalescing around policy goals and objectives can be disordered. For example, had this paper been fixed on charting positive stories only – the “wins” – we would have overlooked the messy process of developing goal congruence.

Second, it is suggest that policy makers should establish aspirational goals and they should do so at the outset. The second tier companies (in terms of size, scale and scope) require as much effort as aspirational ones. They also have many of the same options as larger ones.

Next, the cases described in this paper demonstrate that the motivations of potential partners are not always transparent and therefore, not necessarily aligned with those of policy makers. FDI targets – or any potential partners – may be balancing several objectives, not all of which are visible to policy makers.

As well, the cases highlighted in this paper demonstrate how chaotic investment attraction can be. Understandably, conditions change, prompting shifts in strategy. Planning horizons for projects of the magnitude of a final assembly automotive plant, for example, can extend beyond single business cycles. Even more interesting, this paper shows that big decisions – even ones in big, apparently sophisticated companies – are not always made with measured process and full information. They can be made in an impetuous manner, devoid of governance.

Finally, the cases of failure show that on occasion, efforts are rebuffed or policies fail, not because a strategy is weak, flawed or inadequate. Sometimes, exogenous factors crash in. Should officials be expected to anticipate all challenges? Should they be constantly at the ready to adjust course? The answer to both seems “unlikely.”

**HIROMI, S.:** Luxury Vehicle Market in Brazil - The Different Types of Development

This paper aims to clarify the characteristics of the motorization process in the developing countries such as Brazil. Especially in the luxury vehicle market, it is completely different from that of the developed countries. In the developed countries, luxury sedan cars such as Mercedes Benz S occupy the luxury vehicle market, in the developing countries; however, SUV (Sport Utility Vehicle) or high grade Mini Van sometimes occupy the luxury vehicle market. We analyze why SUV and high grade Mini Van could take part in the luxury vehicle markets in Brazil as a case study.

**Smitka, M.:** From National to Regional to Global

From National to Regional to Global

Europe was once a fragmented set of national markets, exemplified by Ford's separate operations in the UK, France and Germany. The European Common Market lowered trade barriers, but the Block Exemption continued to restrict intra-Europe vehicle sales and repair markets. These were eased in 2002 and effectively eliminated in 2010. How did firms adapt to this long transition, in comparison for example changes following the US-Canada Auto Pact of 1966 in North America and the growth of trans-Pacific trade by Japanese firms? I present three hypotheses. First, European firms came late to building international operations, and so remain headquarters-oriented. Second, firms adopted divergent strategies, with the use of acquisitions by the VW group in contrast to organic growth by others. Third, suppliers moved more quickly than assemblers, with more decentralized operations and strong regional R&D capabilities. The answers to these questions matter because they then shape corporate strategies that affect the shape and magnitude of the value chain, including those in emerging markets such as China and Mexico.

This project is in its initial stage, and seeks to draw upon the GERPISA network to help refine questions and suggest resources.
Embedding the automobile in societal contexts: new services, new applications, new integrated mobility systems, new business models

Higashi, H.: Does “driving range” really matter? The hidden cost of Gasoline Vehicles and the potential value of Electric Vehicles: -From the cases of agricultural enterprises in a countryside of Japan-

This research attempts to the economic value of the electrical vehicles (EVs) in a certain business condition. Describing the cases of agricultural enterprise in Japanese countryside area, the author proves that using internal combustion engine vehicles (ICEVs) becomes a kind of burden of their business. This research is idiosyncratic because it calculates the hidden cost of keeping ICEVs in terms of productivity and working load.

Especially in the countryside of Japan, where the number of gas station continuously decreasing, the working load of refueling the vehicle becomes the burden. And the agricultural enterprise usually operates multiple vehicles for their business. In Yamanashi prefecture, there are many number of fruit farmers producing peach, grape, and plum. They grow the trees on the slope of mountains and their farm field are usually scattering. In such a situation, each car is driven just around 100km or less every day by the workers. Thus, each vehicle has to be refueled almost every week or shorter cycle.

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-One problem is that the distance between the nearest gas station and the farm. It takes more than 15 minutes to get there in some case and it takes more than 45 minutes in total. The other problem is that the interruption of the task. The car must be refueled when the remaining fuel level becomes low, even in the middle of harvesting job. The author found that these problems come from the characteristics of the ICEVs. Even though the driving range of ICEVs is much longer than that of EVs, we can’t exploit whole the range when we use it because of refueling. On the other hand, in many cases the company and home in the countryside can install the charging station for EVs with smaller cost. Since EVs can be charged during the night using the station, it enables to eliminate the refueling job and it helps to boost up the productivity of business such as agriculture.

Pries, L.: The difficult way to change the trail Incremental innovation and path dependency of Diesel technology

The case of Volkswagen’s manipulation of Diesel injection software in order to reduce emissions is emblematic for the situation of the European automobile industry in general. During a century all European carmakers followed the path of incremental innovation of engines driven by fossil combustible. Despite general awareness of the dead end of this route path dependency, power relations, as well as regulative, normative and cognitive inertia hindered most European carmakers to switch to radical innovation. The paper, first, takes the Volkswagen case to analyse the main factors that
could explain the dynamics of the Diesel emission scandal and, second, asks if and what was exceptional or representative for the current dilemmas of the (European) automobile industry.

Marques de Carvalho, M., Silva É. P., Consoni F. L., & Mariotto F. T.: Electric Vehicles Total Cost of Ownership and Public Health Issues in Brazil

Several countries present policy gaps to reduce factors that induce climate change and deterioration of air quality in urban areas. As an illustration, in Brazil, there are very few national or local instruments of public policy, to stimulate the diffusion of pure electric vehicles (EVs), free of combustion emissions.

Nevertheless, the economic impacts, derived from the emissions of internal combustion vehicular particulate matter emissions are significant. Only in São Paulo, Brazil’s largest city, it accounts four thousand deaths per year [1]. In 2007, its health annual cost reached US $ 500 million [2]. Due to congestion, vehicle emissions have become the main source of pollution in Brazilian big cities, summing up an annual economic impact derived from health issues caused by air pollution of US $ 1.7 billion [3].

The cost of using EVs in Brazil is significantly lower than similar combustion vehicles; however, its acquisition cost is very high, resulting in a higher total cost of ownership (TCO), even for a long period as five years of use. The analysis of this paper considers a case of EV’s TCO [4] and from its results and also from data on the emissions’ costs to public health, presents a reflection about the absence of policies in the country. It concludes that the final costs justify policies to foster EVs adoption.

The study was developed through analyses of two measured costs that: (1) EV TCO of three small corporate fleets; (2) the cost to public health due to pollutant emissions from light vehicles in the region of São Paulo.

The analysis compares the TCO of the electric vehicles (EVs) and similar internal combustion. The scenarios (with and without taxes) consider periods of five years and vary according to: use intensity; costs of acquisition and use; residual value. Acquisition costs were broken down according to the chain of applicable taxes. Scheduled maintenance costs, consumption (electricity and fuel) and annual tax were considered. For EVs, it includes battery autonomy and lifecycles.

The data was obtained from daily measurements of the use of EVs, since December, 2013. Information about each VE and company has been calculated, such as distance traveled (km), energy consumption (kWh), amount spent with energy consumed (US$), expense with fuel consumption (US$).

In turn, the public health cost analysis is based on research developed by the LPAE (Experimental Air Pollution Laboratory - Faculty of Medicine of the University of São Paulo), which calculated the emissions of air pollutants from vehicular sources and estimated its effects in public health, in metropolitan areas [2]. The study applies the methodology DALY (Disability Adjusted Life Years), jointly developed by the World Health Organization and World Bank at Harvard University [5], and uses a model that calculates the number of years of life lost due to some factor, in this case the air pollution, according to the life expectancy of the population.

Comparative graphical results for TCO computations are provided, among them: i) TCO evolution per kilometers of use, with or without residual value; ii) TCO decomposition (acquisition costs taken with no taxes, acquisition taken with taxes, annual use taxes, battery replacement, residual value, scheduled maintenance).
It was found from the comparative analysis of TCO, the economic infeasibility of using EVs in corporate use in Brazil, in the time horizon considered, even though the electricity costs (propulsion) and maintenance are significantly lower. Besides, regulated emissions saving at Great São Paulo metropolitan area have been calculated, considering EVs sales for 50% tax reduction scenario. Health impacts have been surveyed.

The TCOs’ comparison shows that even the EVs presenting lower use cost, it still does not pay its acquisition given the existing high tax burden.

On the other hand, the cost that emission from light vehicles to involve combustion on public health is significant. Activities that negatively impact public goods, such as air pollution, generate associated social costs, taken, in economic terms, as negative externalities. An alternative public policy that could help reduce such costs in Brazil would be the adoption of EVs tax relief. It would help foster its widespread adoption [6] [7].

Policy instruments like these, combined with others, such as improvement of public transport and recharge infrastructure can contribute to reducing some of the main causes that lead to treatments caused by particular matter inhalation. It can be said that high air pollution levels results from unsustainable policies, mainly as in the transport sector.

Public policies – national and regional clusters: between path dependency/inertia and structural change

Nag, B., De D., & Shailendra Singh: Is Indian Automobile Industry getting integrated with Asian Production Network?

International fragmentation of production generally refers to the spreading of production stages across countries. Slicing up the production process and carrying them out in different location allows production cost savings through cross-country differences in factor prices, resources, market sizes, infrastructures and institutional factors. A production network represents linkages within or among a group of firms in a particular value chain for producing specific products such as vehicle, apparel, computer or electronic goods. The literature mostly focuses on how lead firms organise a particular network of subsidiaries, affiliates and suppliers to produce a given product. This has a profound impact on the international trade especially in East and South East Asia. The investment and technology flow from Japanese companies promoted a both way trade between Japan and in these countries leading to product and process upgrading of the goods in most efficient way. International Production Network (IPN) has become an important feature in modern international trade.

Empirical evidence suggests that the emergence of international production networks in East Asia results from market-driven forces such as vertical specialization and higher production costs in the home countries and institutional-led reasons such as free trade agreements. The fragmentation of production requires a sophisticated organization, and involves trade in parts and components and/or trade in tasks. Because of the emergence of IPN as concept, many original equipment manufacturers (OEMs) are reducing their vertical linkage by shredding off completely or some of the operations. This ensures that networking among various suppliers and coordinating the operations are the principal work of the lead players and they act as ‘power centre’ in the production process. These firms set the product strategies, participate in product development and build their own production networks. IPN is a new trend in international trade and developing countries are increasingly getting integrated in the process (Athukorala, 2008).
The proliferation of deeper trade agreements in recent times, which go beyond tariff liberalisation and include the movement of capital, investment, intellectual property, competition policy, services trade and technical barriers to trade, play a critical role in raising the platform for IPN. Baldwin (2008) points out that international production sharing in Asia has developed from a simple North-South outward processing trade to a much broader phenomenon. Lawrence (1996) has indicated that certain national policies need to be harmonised in order to facilitate business activities spread across many countries. This generates demand for deeper forms of integration. There is a requirement of new forms of policies for smooth movement of intermediate goods (Antras and Staiger; 2008) as the value creation at each stage is small and components are more sensitive to trade costs (Nag; 2009 and Nag & De; 2011). Kimura (2006) noted active back-and-forth transactions of machinery parts and components in East and South East Asia among countries with different income levels. Kimura and Obashi (2010) identified that in post 2000 the region have begun to increase intra-regional exports of not only parts and components but also finished products, indicating a potential importance of intra-regional markets as an ultimate source of demand for their exports. Jongwanich and Kohpaiboon (2011) found that foreign and domestic firms in Thailand involved in production networks tend to engage actively in R&D activities, which contributes to achieving high productivity. As automobile industry in East and South East Asia is subject to an efficient IPN, it is now a research question how it is getting extended to other Asian countries such as in India.

The structure of the automobile industry specifically in India is influenced by competition and nature of customer demand. Product cycles continue to grow shorter as more companies adopt the simultaneous engineering approach pioneered by Japanese automakers while developing the product. India is now among the top 10 players in automobile manufacturing. In 2014-15, India has produced 23 million vehicles and out of these 3 million are passenger vehicles. It has experienced a growth of 8.68 per cent over during 2014-15. The automobile industry accounts for 7.1 per cent of the country's GDP. It is expected that by the end 2016, India will become the third largest automotive market in the world ahead of Japan, Germany and Brazil, riding on its domestic automotive sales. Because of high growth all global majors are now interested in Indian market. OEMs in India are buying parts from all kinds of suppliers and are overseeing a large and complicated distribution system (De, 2011). It has now robust component industry and many MNCs are also present in this segment. In 2014-15, the turnover of component industry has been around US$ 38.5 billion. Current trade pattern also indicates that India’s exports are rising steadily. In 2014-15, India exported around 622470 units of passenger vehicles, 85782 commercial vehicles and US$ 11.2 billion of components.

In light of these observations, this paper makes attempt to look into the following issues:

- The nature of evolving IPN in Indian automobile industry, how far Indian firms are participating in IPN, role of technology transfer, possibility of product and process upgrading, etc.
- Nature of foreign value added in India’s gross exports of automobile products • India’s domestic value added in foreign country’s gross exports of automobile products
- Whether trade agreements with Japan, Korea Rep and ASEAN is accentuating the integration among firms especially in automobile industry
- Role of FDI in India’s participation in IPN • India’s policy towards promoting automobile sector (Analysis of Automotive Mission Plan, 2016)

Bungsche, H.: Integration of Production Networks in the Automobile Industry in the ASEAN Countries. A Comparison with the Automobile Industry in the EU.
In 2015 the ASEAN member states founded the ASEAN Economic Community. One basic objective of the ASEAN Economic Community is to establish a common production base and a single market.

One of the industries that is always ahead in establishing international production networks, trying to optimize the value chain is the automobile industry. When looking at the formation of organizations for regional economic cooperation or integration it was in general the automobile manufacturers that often already long before an economic community or free trade area was established (or in the case of the EU new countries were given member status) invested in these prospective countries. This held especially true for the new Central Eastern European member countries of the EU, which already immediately after the collapse of the socialist economic system became favored targets for automobile related investments.

Against this background, it is especially interesting to observe the evolution of automobile production networks in ASEAN, and compare this with the developments in Europe, especially the new EU member states in Central Eastern Europe. As will be seen, production networks are also slowly evolving in the ASEAN countries that are also becoming increasingly integrated into the networks with the ASEAN +3 countries. However, there are considerable differences between the two regions at least at the moment. Whereas Central Eastern Europe foremost developed into low cost production sites and export hubs for West European manufacturers, with the local car markets only slowly increasing, we observe a complete different picture in ASEAN. There, production is directed much more to local automobile demand, while exports are only playing a minor role in automobile related investments. However, this could change in the mid to long-term, when the lifting of custom restrictions lead to more integrated markets and fiercer competition between production locations.

One other interesting aspect is, that like in the new member states of the EU also in ASEAN there is only one country with an own national car industry. In case of CEE it is the Czech Republic, where Skoda (although belonging to the Volkswagen Group) is located. In the case of ASEAN it is Malaysia, where Proton and Perodua, a Japanese-Malaysian joint venture are producing ‘national’ cars. So the question is, whether there are differences observable in industry structure, integration of local companies and in market performance of the national vs the international manufacturers.

Methodology:
Quantitative and qualitative research, historical based research, data analysis.

Expected Results:
The analysis will show that the car industry in ASEAN is in many respects developing in a different way than in the countries of Central Eastern Europe. However, the conditions are also very different. While ASEAN integration just begins to take off, the integration of CEE countries into the EU economy already has more than 25 years of history. Therefore we still see less integrated networks in ASEAN or ASEAN +3 than in Europe. However, at the same time we observe by far much more market oriented developments in the ASEAN countries than in CEE, where car manufacturers are much more focused on optimizing their cost structures and by this increase the competitiveness of the company.

Implication and Relevance for the GERPISA program:
The car industry (still) is setting the pace with regard to globalization and forming international production network. Therefore the study of the car industry in ASEAN will give valuable insight how the region as a whole will proceed to integrate in the future.
The paper especially aims at contributing to the GERPISA research on regional automobile industry development, which has a long tradition at GERPISA.
Akabane, J., Yamamoto H., Tsuchiya Y., Inoue R., & Zhuang Y.: An Experimental Study on the Evolutionary Paths and Development of Capabilities of Local Asian Second Tier Automotive Parts Suppliers-

For this study, a comparative analysis was conducted on a case study of local Thai, Chinese, and Japanese automotive parts suppliers, and differences in evolutionary paths and processes for development of capabilities were identified. Research by Asanuma provides an evaluative framework for capabilities within the automotive parts industry, and has become accepted as a fundamental tool for this purpose (Asanuma [1989], Asanuma [1997]). It is distinguished by its focus on product design capabilities and its ability to express the evolutionary path of an automotive parts supplier as a formula based on drawing format development, namely from the use of supplied drawings to generation of approved drawings. In contrast, most small and medium Thai and Chinese local automotive parts suppliers focused on in this study are specialized in piece processing or assembly contracting, and thus would receive an unambiguously low evaluation as “in the supplied drawings reception stage” if Asanuma’s framework were applied in their evaluation. However, fieldwork thus far has revealed numerous businesses without product design capabilities that have demonstrated sustained development. With this in mind, this study sets a new evaluative framework for local Thai, Chinese, and Japanese small and medium automotive parts suppliers that accounts for their distinct traits, and evaluates said suppliers’ capabilities using the aforementioned framework.

This new framework introduces two new evaluation axes in addition to the traditional means of evaluation via product design capabilities. The first evaluation axis is for production process design capabilities. Production process design capabilities are an indicator of production line process and equipment improvements, and of value analysis or value engineering capabilities. Even suppliers without product design capabilities can enhance productivity and earn customer loyalty by improving production process design capabilities. The second is domain design capability, which shows the degree of diversification in a business domain. Diversification of customers and business domains enhances the stability of a business base. In this study, parts suppliers were evaluated using a three-dimensional framework consisting of Asanuma’s evaluation axis (product design capability) in combination with axes of production process design capabilities and domain design capabilities.

The methodology adopted for this study was that of direct interviews with businesses. As a rule, at least three research team members visited parts suppliers and asked the representative, factory director, or equivalent supervisor in charge of product, production process, and domain design questions related to the aforementioned fields. Production site inspections were also conducted. Afterwards, results were scored by evaluation category and mapped to Evaluation Figure 1 (product design × production process design) and Evaluation Figure 2 (product/production process design × domain design). At this time, surveys of 15 Thai, 11 Chinese, and 6 Japanese local suppliers have been completed. Furthermore, interviews to bring these totals to 20 Thai, 20 Chinese, and 10 Japanese local businesses are planned for completion by the end of March.

Based on these interim results, it is clear that Thai, Chinese, and Japanese local automotive parts businesses can be divided into two types. The first type are suppliers that aim to enhance product and production process design capabilities simultaneously, and that aim to become approved drawing suppliers. This type is common among Japanese local businesses. The second type are suppliers that actively conduct business diversification (domain design capabilities) while working to enhance production process design capabilities. It has been observed that this type is common among Thai and Chinese local suppliers. Furthermore, this second type was not understood using the traditional Asanuma evaluative framework.

The overall significance of this research lies in its successful demonstration of two evolutionary paths: “manufacturing orientation” and “domain orientation.” This was achieved using three-dimensional evaluation axes of product design,
production process design, and domain design. In particular, “domain orientation” is thought to be an evolutionary path unique to Asian local suppliers.

**Domanski, B., Guzik R., & Gwosdz K.:** The place of Central Europe in the European automotive industry: mechanisms and barriers of upgrading

Central Europe has been playing an important role in the business strategies of European, American and Asian carmakers and major automotive suppliers in the last two decades. The reorganization of production systems and supply chains led to a great expansion of the automotive industry in this region and found expression in the spectacular growth of exports to West European core countries and growing local sourcing. Industrial upgrading processes taking place since the 1990s have resulted in a currently complex picture, with a dual role of the Central European automotive sector in the European division of labor. It comprises a whole range of activities from the simple production of labor-intensive parts to advanced high-value added components and some R&D. This shows that rapid industrial upgrading through foreign investment and its regional embeddedness may lead to significant value creation in the periphery. However, the crucial question in the context of development led by foreign investors is the role of local producers and the long-term sustainability of such a model of growth.

It can be argued that a further upgrading of the Central European automotive industry will be determined by the building of a stronger independent position by domestic suppliers and the functional upgrading of foreign subsidiaries including the development of design capabilities. Otherwise, the limited decision-making and innovation competences will keep Poland and other Central European countries in an inferior position dependent on the core countries. Solaris, one of the European leaders in the manufacturing of hybrid and electric buses, and Boryszew, a fast growing producer of plastic components expanding through global acquisitions, provide examples of successful Polish automotive companies. At the same time, the majority of domestic suppliers face significant barriers to functional upgrading including limited financial capabilities and design expertise as well as lack of trust on the part of their global customers. The motivation and qualities of local managers and labor cannot be ignored here together with industrial relations and government policies and regulations providing general framework for the functioning of the automotive industry.

**Calabrese, G. G.:** The Italian automotive industry between old and new drivers

The presentation showe the Italian automotive industry between old and new drivers, that is export, quality and FCA. The presentation provides also the current situation of the industrial relations and industrial policy in Italy

**New technologies: sustainable mobility or brave new world**

**Lara, A.:** The new paradigm: Development of Autonomous Vehicles

The paradigm of the auto industry could be transformed with the arrival of autonomous vehicles. The purpose of this work is classify autonomous vehicles (conceptual, prototype and production) according to six levels of automation: no automation, driver asistencia, partial automation, conditional automation, high automation and full automation. (SAE, 2013). This taxonomy allows us to understand the evolution of autonomous vehicles considering four capabilities: accelerating, braking, represent the environment and driving.

Evidence indicates that of the 14 developed autonomous vehicles, the main bottleneck is related to the different forms of vision (lidar, radar, stereo camera, etc.) necessary to represent the environment. Our results help to understand: i) the way companies are developing autonomous vehicles; ii) the nature of technological change, its imbalances and restrictions; iii) the new institutional rules associated with its use.
January 22, 2013 was the “innovation day” on which the Center for R&D of PSA Peugeot Citroën (PSA, hereafter) in France presented the major “PSA Innovations for Car of the Future”. About a hundred journalists, policymakers, investors, economic and industrial partners of the carmaker gathered to find out about the new technologies to meet the challenges of tomorrow’s car: urbanization, climate change, evolution in consumer usage and their mobility patterns. Among the technologies unveiled, there was a breakthrough technology called "Hybrid Air." It combined petrol and compressed air to offer a key step toward the vehicle 2l/100km.

In March 2013, during the International Automobile Motor Show in Geneva, using a prototype vehicle, Citroën presented the first Hybrid Air application. At the manufacturer's stand, the French Minister of Productive Recovery, Arnaud Montebourg, welcomed this innovation and highlighted PSA’s ability to meet tomorrow's challenges, despite the economic difficulties that this manufacturer was facing. The next day, one could read in the press headlines, "PSA struck a blow with a revolutionary innovation". The commercialization of the vehicle was scheduled for 2016.

Two years after the announcement and a year before the commencement of car sales, the general and specialized press, as well as blogs of automotive industry experts, announced the end of Hybrid Air adventure: “Deflated: Peugeot Citroën Shelves Its Air Hybrid Technology” (January 26, 2015 at 4:51 pm by Mike Duff). The headline of the newspaper Les Echos read, "Hybrid Air put definitely on the shelf." In response to these catchy press headlines, PSA communication services nuanced by saying “…its moment may still come”; “We have no plans to cancel the project,” as a PSA spokeswoman told Automotive News Europe. If Hybrid Air was a great invention, it has never been an innovation.

The hybrid Air case is a great source of knowledge about disruptive innovations and the way they can be managed. The disruptiveness appeared at both product and process levels. At the product level, Hybrid Air is a radical innovative hybridization technology combining a petrol engine, a compressed air energy storage unit, a hydraulic pump unit, and an automatic transmission. An intelligent electronic management system adapts the operating mode to the user’s driving style and optimizes energy efficiency. At the process level, Hybrid Air is a radical innovative mode of governance and management of innovation. PSA took the opportunity to test a new method for managing innovation aligned with the needs of a high-stake project. This innovative project was conducted in secret by a dedicated project team within an isolated skunkworks structure.

At a time where disruptive innovation is glorified as the only way to create value in a highly competitive world, our work contributes to framing the conditions of transformation of inventions into innovations. Our analysis pays a specific attention to the conditions for skunkworks structure in the innovation process.

Two data collection methods were used. First, we collected primary data from notes taken at conferences, seminars, and workshops in which PSA and Hybrid Air collaborators shared the content and history of the project. This data collection was enriched with formal semi-structured interviews, as well as recordings of two of the main project managers. We also conducted informal interviews with collaborators working for the Advanced R&D Department at PSA and people from partner companies. The second and main source of information was indirect. We analyzed secondary sources such as press articles, specialist automobile blogs, YouTube videos of the project, recordings of project members’ participation in courses taught in engineering schools or research seminars. All information was collected between January 23rd and September 2015.
The article will be structured in Three parts. The first part will present the case, described by practitioners as an "innovation revolution (AIR)". The second part will present a literature review on skunkworks innovation projects. Finally, the third part will discuss the project’s organizational innovation and analyze its implementation limits regarding the skunkworks literature.

Peralta, R. T., Galan F. C., & Covarrubias A.: Challenges and possibilities for the introduction of autonomous vehicles in Mexico

There are several terms to describe the smart car: self-driving car, driverless car, autonomous vehicle, among others. These concepts encompass the idea of a vehicle that can be driven alone without human intervention. In the last decade the advances in this technology have put smart vehicles on the streets in several countries (including Mexico, very briefly). Several universities and companies are developing the technology and software needed to make this technology available to the population in a near future. In this article we explore the possibilities, obstacles and key challenges for the introduction of autonomous vehicles in Mexico.

The impact of autonomous vehicles in society:

Smart cars navigate by themselves without the need of human assistance, providing several benefits to communities. Being a machine, the lack of emotions, the strict adherence to law and proper behaviour makes them the perfect vehicle to reduce the risk of accidents. The self-driving feature allows people with disabilities to commute without the need of others. In Mexico, in 2010, there were more than 5 million 700 thousand people with disabilities [INEGI, 2010]. Introducing smart cars in Mexico would be a fair measure of inclusion. In addition, the introduction of smart cars could reduce the number of road accidents as the number of cars in circulation, decreasing pollution caused by carbon dioxide emissions, a problem in big cities, as Mexico City.

By 2020, it is estimated that 10 million cars with a higher level of automation will be sold, and by 2019, the introduction of the first autonomous car in the market [BI Intelligence, 2015]. Tesla announced that in 2018, their cars will reach total autonomy [Fortune, 2015], while the IEEE (Institute of Electrical and Electronics Engineers) predicts that 75% of cars in 2040 will be autonomous. The advent of smart cars into Mexico is imminent, but what are the challenges that must be overcome before the entering of autonomous vehicles into the country?

The challenges of the introduction of self-driving vehicles into México:
The introduction of the smart car to Mexico faces several obstacles, such as poor infrastructure, poor road culture, no legal framework, among others. If these problems remain unsolved, the delay of the introduction of the technology could put the country at a disadvantaged position. Some of the most important issues that must be addressed are listed below.

Computer vision limitations:
Autonomous cars depend on complex algorithms of artificial intelligence and computer vision to acquire information from the environment and take decisions in real time. Those algorithms cover different problems but also rely on specific conditions and several assumptions, as for instance, the detection of traffic signs and its proper interpretation is crucial to navigate accordingly and avoid collisions. In order to do so, the sign must be readable and in place. In Mexico, sign vandalism and the lack of proper traffic signs is a problem all around the country. Also, the irregularities of roads and the visual pollution caused by a number of advertisement on streets make signs localisation a very difficult task, even for the best algorithms.
In October 2015 the smart car prototype "AutoNOMOS" of the Free University of Berlin traveled two times from Nogales, Sonora to Mexico City, the first one to make a digital map of the road, driven by a human pilot and the second one to travel autonomously. The project leader, Raul Rojas, said that Mexico represented a major technological challenge: "The tour was a challenge because Mexican roads differ from European, having bumps, caps and lack of delineation of lanes or areas construction" [La Jornada, 2015].

Connectivity:
Interconnectivity is needed for optimum performance and safety navigation of autonomous vehicles. Intervehicular communication supports the information flow among smart cars traveling on the same road to broadcast any alert to others and help them to make the right decisions in order to avoid collisions or traffic congestions optimizing the route to their destination.

In Mexico, the wifi coverage is not guaranteed (Figure 4). For instance, along the international highway the most important highway to traverse the country the signal is not constant nor strong. The circulation of smart cars on those roads would not be safe, and it is precisely on these highways where the selfdriving feature would be most useful to enable passengers make use of long hours during a safe travel.

Legislation:
Smart cars are in a testing phase; they will become part of our urban scenario in the next years, and the figure of an autonomous vehicle must be included in the mexican constitution. Some US states have already approved the circulation of smart cars on their roads, such as California, Nevada, Florida and Washington, D.C. In Mexico there is no legislation considering the use of smart cars at any level, and the Internet of Things is also not regulated. The liability of an entity when a smart car is involved in a collision with another car as well as accidents involving people must be established in the law. Also, public policies must be proposed to support the acquisition and use of smart vehicles.

It is expected that by 2017 the first total autonomous car hit the market in the United States. Even when there is no date available for the introduction of smart cars to Mexico, we can expect their arrival in the second decade of this century. The proper debating on the legislation, infrastructure, security, ethical and cultural aspects is needed in order to be prepared for that moment.


In recent years, battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) have been attracting growing attentions as important countermeasures for global warming, air pollution and energy security issues which are caused by internal combustion engine vehicles (ICEVs). Since the electrochemical power generation devices (lithium ion batteries in LIBs and fuel cells in FCs) are powered by electricity and hydrogen, the devices do not emit CO2 or any polluting substances upon operations, and electricity and hydrogen are widely available from any renewable power sources and water electrolyzers, when they are needed.

Another merit for electrochemical power generation devices is a significant manufacturing cost reduction. This is considered to be caused by an inherent difference in the fundamental parts structures. While the internal combustion engine is composed of one thousand 3 dimensional (3D) high precision parts with many variations, the electrochemical power generation device is composed of one thousand 2 dimensional (2D) flat sheets with few variations.
Even though huge efforts have been made by the industry and the government, the economic growth of electric vehicles is still slow. This could be attributed to 1) limited availability of energies (or, electricity and hydrogen) and 2) the high entry price of electrochemical power generation devices. It is true that the entry price of a gasoline engine cannot be less expensive. Because the 3D parts production facility (which assembles high precision 3D parts with many variations) cannot be simple and small enough to be depreciated quickly. However, the 2D parts production facility (which assembles flat sheet materials with few variations) can be simple and small enough to be depreciated quickly as far as the facility is not contaminated by 3D parts manufacturing at all.

Typical 2D manufacturing technology can be seen in book or newspaper factories. The 2D manufacturing technology is called “the roll-to-roll process”. Basically it has a set of free rollers and only one winding motor at the end of the production line. The winding motor drives a flat sheet from a feed roll throughout manufacturing processes in the production line continuously. However, though any electrochemical power generation devices are made of flat sheets, they are not always supplied by a roll, but a cut sheet. We call it a contamination of 3D parts manufacturing into 2D parts manufacturing.

This research focuses on the cost reduction potential of electrochemical power generation devices by eliminating the contamination of 3D parts manufacturing into 2D parts manufacturing. A key factor price per weight which was estimated by the export statistics of Japan will be discussed to measure the cost reduction potential of 2D parts products. This research also focuses on the impact of 2D parts revolution to not only automotive industry but also broaden energy industries.

**Bermudez, T., & Consoni F.:** Scientific and technological trends of lithium-ion batteries for electri vehicle: insights from the application of bibliometric and patent analysis

Electric vehicles represent one alternative to traditional propulsion systems, because they reach better energy efficiency, reduce dependence on fossil fuels and reduce the percentage of greenhouse gas emissions and particulate materials that generate impacts on the environment and human health.

Despite the benefits of the use of electric vehicles, they have to overcome technological problems related to batteries’ optimization and performance, such as recharging time, circulation autonomy, weight, volume, safety, energy density, cost, lifespan and impact on the environment.

Among the different battery technologies for electric vehicles, lithium-ion batteries are highlighted for its higher energy density, higher power, lower weight and reduced environmental impact in relation to the lead-acid batteries.

This paper intends to present an overview on the main scientific and technological trends related to lithium-ion batteries for electric vehicle through a bibliometric and 2 patent analysis. This kind of analysis is important to identify the growth of research and scientific production with the technology, technological trajectories, productivity of authors and the different type of institutions involved (scientific institutions, universities and companies) along with the collaboration between them.
Kawabe, Y.: Research survey results for the efficient Central and South America auto parts suppliers for the North American region auto part

After TPP negotiations have concluded, auto parts price competition within the participant economies, and not only the competition in each individual country, but particularly in relation to the NAFTA region, in order to manage a sustainable stable economy growth, it is needed to secure an appropriate auto parts supply chain within the ASEAN region, including the Central and south America region’s auto parts supplier.

Bearing in mind that 10 years ago, the results on the Chinese parts prices and development of cheap parts suppliers’ constant waste of time, decline on technology and competitiveness, among other problems, many were forced to adopt the high price global supplier parts in order to adapt to schedule of automobile development.

Looking at the current conditions of TPP, it would not be considerable a new research for a longer period of time on production supply and new parts suppliers development.

Then, taking into consideration ISO, as well as Western and Japanese automobile manufacturers research surveys items, highly simplifying and based on MT method of quality engineering (Taguchi method), an e-mail based inquiry survey was conducted in order to analyze individually each supplier’s candidate components, and also as a result of performing factory visits and detailed investigations, it is confirmed that the number of steps involved in car components suppliers development could be greatly reduced. Hence, the development focused only on effective components suppliers could be accomplished.

This research was first conducted in Japan to review the characteristics of the Japanese parts suppliers within the Tokai Region. This time, based in this content and supported by ProMexico’s cooperation, a survey was conducted in Mexico to report the different types of challenges and differences with the Japanese features. By furthering this study to evaluate the entire auto part supplier’s quality from Mexico to Central and South America, an extensive evaluation of the Central and South America entire auto parts supply quality, delivery time and costs levels evaluation could be accomplished.


In recent years, services have become a key element to promote higher value-added activities in the automotive sector. The evidence suggests that the development of professional, financial and logistical services have been an important catalyst to stimulate the innovation cycle in the automotive sector. This paper presents empirical evidence of the automotive companies established in Mexico in relation to the role played by the services in the environmental innovation cycle. The paper shows that the interface mechanism is mediated by the approval of environmental competencies and coexistence of differentiated organizational learning processes; which has led to the composition of isomorphic organizational structures, but with divergent cognitive processes. Based on a quasi-experimental design, in-depth interviews with managers and visits to automotive assemblers and auto parts companies located in Mexico are made.

This paper proposes that the development of services on a regional scale is an opportunity of productive specialization to the 2nd automobile revolution, characterized by the transition to the production of cars with greater energy efficiency and lower emissions generation. In summary, this paper presents the main drivers, challenges and opportunities to increase environmental innovation capabilities in the automotive sector in Mexico based on services.

de Paula, R. A. S. R., Bagno R. B., Salerno M. S., & Marx R.: Corporate innovation program in a powertrain firm: a case study of implementation and evolution phases

This paper analyzes how an established firm, in the automotive Brazilian value chain, conducted a corporate innovation program to improve its capability of developing high uncertainty innovations. In recent decades, innovation has been recognized as an imperative for companies to achieve competitiveness. In this context, some literature strands, mainly
based on the experience of large and technology-based firms that set new dedicated structures to manage innovation, has been pointing out that innovation gradually emerges as a new organizational function. However, Innovation Function (IF) is still an embryonic concept and demands deeper analysis of its characteristics and consolidation process. Furthermore, literature argues that setting a corporate innovation program is an alternative to start the efforts in designing such a function and learn from the first results.

In this study, we present how an established firm, in the automotive Brazilian value chain, designed and implemented a corporate innovation program. As participant observers for two years, we conducted an inductive case study that led to three main outcomes: (i) a theoretical typology for innovation function; (ii) the proposition of four distinct phases to explain the evolution of the innovation program; and (iii) the identification of some constitutive elements of organizational structure to promote high uncertainty innovations.

Muniz, S. T., & Belzowski B. M.: Platforms to enhance electric vehicles competitiveness: the strategies of VW and Ford

The platform's goal is to reduce costs by increasing economies of scale and economies of scope without neglecting the flexibility to meet the needs of consumers and regional demands. In the automotive industry, the production of high volumes on the platforms of conventional gasoline-powered vehicles, by the communization of parts and components, enables a substantial drop in costs, but imposes serious restrictions on the production of electric vehicles (EVs) in these same platforms. The decision making between manufacturing Hybrid Electric Vehicles (HEVs), Plug-In Hybrid Electric Vehicles (PHEVs) and Battery Electric Vehicles (BEVs) on the same Internal Combustion Engine Vehicles (ICEVs) platforms or making them on a new, dedicated platform need to consider, on the one hand, the high costs associated with developing and maintaining a new dedicated platform, despite related to its low scale and, on the other hand, the advantages of developing a new electric car that optimizes the range of the vehicle.

Special attention needs to be paid to battery packs. As they are very heavy and bulky, they need a special design, with special features to accommodate it. As the platform of a ICEV is not originally designed to accommodate the significant volume and weight of a battery pack, it is allocate and adapted in available spaces on an ICEV’s chassis, which generally limits significantly the electric range of the electric vehicle, due to restrictions of space available while not compromising the vehicle’s performance and dynamics.

Thus, which platform strategies are being adopted by automakers to increase the competitiveness of its electric vehicles? In this article we will present and discuss two distinctly electric vehicles platforms strategies. On one hand, Ford’s strategy with shared EVs in conventional ICEVs platforms to achieve lower costs and enable production of these vehicles in a world-wide basis. On the other hand, the Volkswagen Group, which recently changed its strategy to share the production of its EVs on the same platforms of their ICEVs to a strategy of a dedicated platform for their next generation of electric vehicles. This analysis is based on information and data provided by carmaker’s annual reports, sustainability reports and also by the literature and press releases. Ford’s strategy to make its EVs competitive is to build them in their global high volume platforms. Using global platforms costs are reduced by achieving economies of scale – for both the company and its global suppliers - by enhancing volume world-wide, with commonality of parts and components, and at the same time enabling a reduction in the complexity of the vehicles, converting them to a common base. This design also provides flexibility to achieve Ford’s “electrification” strategy. The goal of the Ford is to offer an “electric matrix”, a wide range of electric vehicles, with a variety of electrified powertrains. Thus, it covers a wide range of vehicle segments, including compact sedans, utility and luxury vehicles. In addition to economies of scale at high-volume global platforms, the sharing of electric components between the various electric vehicles can improve the commonality and decrease costs. The Volkswagen Group’s strategy changed completely in a few years. Initially, the Volkswagen Group announced in 2012 that their electric vehicles would be produced on the same ICEV’s platforms, mostly on its MQB platform, or Modular Transverse Matrix, for all its bands. The MQB was launched as a flexible platform in terms of powertrains, allowing the manufacture of vehicles with different engines on the same platform, including gasoline and diesel ICEVs as well as HEVs, PHEVs and BEVs.
Though the MQB was launched as a new concept platform, with high flexibility and capable of accommodating a wide range of vehicles with the significant improvement for its new e-Golf, the VW Group more recently decided to create a new dedicated platform, the MEB (Modular Electric Kit), in order to make BEVs on a new basis, improving an electric range up to 310 miles (about 500 Km). The MEB is designed to manufacture the new generation of BEVs with appropriate space for electric components and large batteries – with much more electric range than the today’s VW Group’s vehicles. Thus, automakers must balance the advantages and disadvantages of building an electric vehicle on the same ICEV’s platform, with an extraordinary benefit of improving economies of scale or build them on a exclusively, dedicated platform, with a more appropriate electric architecture for its EVs, allowing them to overcome the limitations imposed on a shared platform.


The US auto industry continues to work towards its 2025 Corporate Average Fuel Economy (CAFE) goals, and the Powertrain Strategies for the 21st Century (PTS21) survey continues to track that progress by asking industry experts from the auto manufacturers, suppliers, and academics, NGOs, government officials, and consultants what they think the US fleet will look like in 2025. The results come from a survey of these stakeholders and cover topics including fuel price estimates, CAFE and emissions strategies, consumer sensitivity to fuel economy, passenger car and light truck powertrain penetration estimates, advanced internal combustion engine technologies, consumer willingness to pay for alternative powertrains, battery type penetration, and weight reduction strategies. Many of these topics are also compared to our 2012 survey in order to see how, if at all, industry estimates and strategies have changed.

Answers to these questions provide insight into what experts think the industry will look like compared to the government’s vision when it designed the 2025 goals. As the industry and government begin their discussions during the upcoming Mid-Term Review in 2016-2017, the government can decide to keep the original goals, increase the goals, decrease the goals, or extend the timeframe for meeting the goals. The results from our 2014-2015 PTS21 survey show a number of disconnects between what the government originally expected to occur in 2025 and what the industry thinks powertrains will look like.

Scur, G., de Mello A. M., &Schreiner L. C.: Ecodesign Practices in Heavyweight Vehicles Development – A Case Study about the Impact of Euro5 emission standard in Brazilian Industry

The aim of this article is to investigate how practices such as ecodesign and green product development are being adopted by a truck manufacturer located in São Paulo and its engine supplier and what role incentive public policies or regulations play in this behavior. Laws and regulations have increasingly mandated the commercial vehicle and truck market to ensure that its products reduce their environmental impacts. This study shows that in addition to meeting the standards and legislation, the automaker uses ecodesign practices during the development cycle of products, such as a design for eliminating harmful and hazardous materials, a project that allows recycling, the reuse of parts, and energy efficiency, reducing the environmental impact. However, without the existence of the standard, products with lower environmental impacts would hardly be developed.

de Marques, M. C., & Consoni F. L.: Mobility Ecosystems and the Role of Public Policy

Mobility trends will continuously impact the automotive industry and must result in increasing incorporation of technologies such as electrified propulsion, connectivity and autonomous systems. These solutions also include components that are being developed under the so-called Internet of Things (IoT). According to ITU- T (2015), IoT is a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies. Physical things exist in the physical world and are capable of being sensed, actuated and connected, while virtual things exist in the information world and are capable of being stored, processed and accessed. The IoT applications include various kinds of applications, e.g., "intelligent transportation systems", "smart grid", and "smart home". The applications can be based on proprietary application platforms, but can also be built upon common service/application support platform(s).
New vehicle devices, applications and services are currently being developed based on the IoT architecture. According to Ding (2015), for example, the province of Shanghai electronically monitors the use of 32,000 electric and hybrid vehicles (EVs), mainly the performance of their batteries, in order to improve technology development and incentive policies based on batteries autonomy. Objects (electric vehicles, batteries, electric charging stations) are monitored continuously and instantly (real time). In the case of batteries, 15 parameters are sensed, collected, processed and transmitted, such as power battery pack, maximum and minimum temperature, current of high voltage.

Based on Machina Research and Telefónica Digital top automaker’s survey, FORBES (2016) points that there is a huge market opportunity for connected vehicles, as multiple challenges are solved, mainly through cooperation between the automakers and mobile industries. Similarly, opportunities and challenges for EV’s connection to power grids depend also on cooperation between car manufacturers and electric power industry, as verified in recent pre-commercial experiences CODANI (2015), KEMPTON (2015).

Due innovative characteristics of these solutions, they face technological, institutional, social and cultural barriers to become market consolidated. The EVs face also the so called Carbon-lockin UNRUH (2006). Overcoming such barriers requires, on the one hand, the adoption of new strategies by companies, on the other, governments (central and local) playing key roles. Some companies adopt competencies integration strategy, i.e. Tesla automaker VANCE (2015). In other contexts, there are efforts to facilitate diverse actors’ cooperation, besides to conceive new inter-organization governance models, as in an ongoing experimental project of innovative mobility solutions, aimed also at driverless and wireless dynamic charging tests, at Satory Tracks (FAUL, 2015).

Public policies are crucial to overcome barriers to innovation. Teece (1986), for example, highlights the role of public policy in order to promote innovation, which should focus, besides R&D, on complementary assets and the underlying infrastructure. ATTIAS & MIRA BONNARDEL (2015) highlights the key role of government to decarbonize and decongest cities, and the undergoing transition from automotive industry to an ecosystem of electromobility. Given examples of regulation to reduce pollution were: European standards of CO2 emissions CAFE (Clean Air For Europe), biofuels standards (USA), low emission zones (Tokyo and Berlin), circulation with alternating traffic (Beijing), restrictions on ownership of vehicles (Shanghai). Examples of traffic management policy implemented by municipalities: congestion charge zone (London), odd-even license plate and restriction for non-residents (Beijing), High Occupancy Vehicle lanes (HOV) (Los Angeles). In addition to these, several countries have implemented policies to overcome barriers to the development and dissemination of EVs, i.e., USA[1], Japan[2], China[3] and Europe[4]. Most studies reinforce the need for coordinated policies to eliminate market failures and to face the Carbon-lockin, which can prevent the spread of EVs. Besides, Kempton & Petit (2014) highlight the public policies to better integrate EVs to the power grid.

Taking into account verified evidences about mobility and the automotive industry transitions, besides pertinent issues on innovation literature, this study aims at understanding the role of public policy in overcoming barriers to establishing new vehicle technologies. Its working method has been mainly surveying and analyzing literature, such as scientific papers and industries focused studies, regarding: i) the context of the automotive industry transformation; ii) new technological trajectories of the automobile industry; iii) ecosystems and emerging business models; iv) challenges to the new technological trajectories; v) public policies to overcome such challenges.

The main findings about automotive industry major changing forces, were: i) stronger market development on emerging countries, which also leads to the formation of joint ventures and partnerships between global and emerging companies; ii) main transforming technologies are electrification of vehicle propulsion, connected and autonomous vehicles; iii) changing user preferences, especially new generation, which are already more prone to connectivity and
green cars and consider vehicle ownership less relevant; iv) intensifying environmental policies. Technological trajectories have provided understanding on main architectures and components, namely the automotive IoT to connected and autonomous vehicles, as well as the EVs´ powertrains.

Among the challenges for the realization of the identified technological trajectories, it is important that actors acquire better ecosystem understanding, besides business models evolution capabilities. Regarding automotive IoT ecosystem, it has been found key roles, as well as business models possibilities depending on the customer profile (business, consumer) and degree of openness of the ecosystem (open, closed). In the case of EVs, it relevant designing flexible business models and partnering in the ecosystem.

The public policies for EVs´ diffusion and technology development has showed many applied instruments of policies, selected from a large number of references[5], i.e.: exemption from automobile registration; exemption from annual circulation tax; tax credits or sales tax reductions; rebates based on emissions and battery size; free parking in certain areas; free charging at public stations; public procurement for innovation; incentive plans and grants for R&D; investment incentives towards electric recharging infrastructure; Smart Grid projects. The policy surveys that favor the development of the automotive IoT is in progress.

This conducted survey and analysis has indicated preliminarily that new automotive industry technological trajectories have emerged in recent years. Some of its technologies are disruptive and have the potential to transform the structure of the automotive industry and the main ways of creating value. Information technology industry and energy industry have the potential to become more relevant in the growing ecosystems. There are indications that companies will have to adapt continuously to act more focused on the ecosystem that comprehends its new solutions and business models. Business models will be more effective as long actors have greater influence on the ecosystem. In such context, developing dynamic capabilities will be crucial.

The performance of companies will greatly depend on strategic decisions involving integrating new capabilities or outsourcing them from the ecosystem. Whatever the business strategy selected, the role of governments will also be crucial, once well-enforced policies can assist in overcoming the technical, institutional and cultural barriers, including creating conditions so that companies might become more ecosystems focused.

Vallejo, B., & Montalvo C.: Technological trajectory changes and the integration of new systems. The case study of the auto industry.

The first half of the Europe 2020 (EU2020) strategy’s implementation is already indicating new forms of interaction forged by the needs of a Europe unable to compete against low labour costs, while also maintaining protective labour rights, as it seeks to implement a development agenda with the motto of “smart, sustainable and inclusive growth.” Under this umbrella, Horizon 2020 (H2020) is resulting not only in new forms of pre-market competition, but also in the creation of new markets. This research aims to explore the key features of the dynamics of a different approach to economic and sectoral development. This approach is the one proposed by the EU2020, in which technological and institutional changes are increasingly reconfiguring existing global value chains.

By taking up the case of clean, safe and integral mobility, this research will reveal key features of a new approach to economic development that is no longer focused on promoting individual industries, as is the case in non-European countries. The new industrial and innovation policy under EU2020 emphasizes the need for intra-regional, intra-sectoral and multi-disciplinary collaboration. Therefore, as an example, the automobile industry, which is also very important due to the levels of employment it generate, is losing its relevance as specific industry under the European
2020 strategy and resurfing as part of a larger societal goal – in this case, the green mobility debate. In other words, individual industries stop being protagonists and become part of a larger initiative, such as mobility, together with firms from other industries that also have capabilities and infrastructures related to the societal challenge addressed (Vallejo, 2015).

The research starts with the realization that Europe is moving towards new forms of joint competition in A relevant transition in the interaction between technology regulation and policy on the one hand, and competition among firms on the other hand, has started in Europe through the H2020 framework. In a Europe unable to compete based on labor costs and with highly protective labor rights, the funding under H2020 is resulting not only in new forms of pre-market competition, but also in the creation of new markets.

This research proposes to analyze the dynamics of two different approaches to sectoral development, the one under H2020 versus the traditional sector development predominant in non-EU developing countries. By taking the case of integral mobility, the research shows how the developmental approach is no longer focused on promoting individual industries, as it is the case in Latin America and other non-European countries, but on societal challenges. The competition for H2020 grants has brought to Europe the need for intra-regional, intra-sectoral and multi-disciplinary collaboration. Therefore, under the H2020 framework, firms in the automobile, aeronautics and railway industries, for example, are losing their relevance as specific-industry manufacturers and resurfing as part of a larger societal goal; in this case, the green mobility debate. In other words, they stop being protagonist, to become a part of a larger initiative, such as mobility, together with firms from other industries but with capabilities related to the societal challenge addressed.

The research argues that Europe is moving towards new forms of joint competition in which not only are industries rising to meet societal challenges and industrial leadership, but also partnerships are the key element of competition. Under H2020, the competition is shifting towards the pre-competitive stages of commercialization. Under this scheme, the coordination and arrangement of technology platforms across diverse sectors takes high relevance, as competition moves from current competitive markets towards competition (in the pre-competitive stage) for future markets.

When talking about the H2020 targets, we should keep in mind that the direction is from the societal goals towards the technology, and not the other way around, as it was in previous EU framework programs. Under H2020, the societal challenges agenda aims to guide and most importantly, to legitimize, the technological trajectories followed, while facilitating the creation of new markets. It is a framework in which, on the one hand, public policy establishes the goals and pushes the transformation (Geels, 2014; Mazzucato et al., 2015; Montalvo & Leijten, 2015). And, on the other hand, it allows participants to address existing market barriers and to pilot production in what Montalvo and Leijten (2015, p. 25) called “funding for the removal of market barriers.” Most importantly, and a key determinant in the future of this transition, it provides a platform to foster [European] patents regarding the technologies developed.

The introduction of Technological Readiness Levels (RTL) requirements added a new dimension to H2020 calls, not only to measure the level of maturity of the technology (within and at the end of the project), but also to specify the scope of the project’s activities. The dynamics of these new forms of interaction are still unexplored academically. Studies such as that of Schaltegger, Hansen and Ludeke-Freund (2015) highlight the emergence of new types of business models and business strategies derived from these new forms of interaction. It is clear that Europe is starting a whole new way of interaction towards technology-ownership competitiveness, whose implications are still not only unknown but also not understood by external entities.
Based on key-interviews and document analysis aims to explore these interactions and dynamics for the case of integral mobility while also presenting, by taking the case study of Mexico, the development strategies which take parts of the H2020 concepts, but not its integral approach, while continuing with the individual industry (i.e., automobile, aeronautic and railway) development approach.

**Fujimoto, T.:** An Architectural Analysis of Green Cars

As the automobiles of the 21st century face severer environmental-energy-safety constraints, major changes of their designs are indispensable. As for the vehicle motive power, we have a variety of alternative technologies including traditional internal combustion engines (e.g., gasoline, diesel), electric motors (e.g., with secondary batteries, fuel-cell), and their hybrids (parallel, parallel-series, series or range extender). As all of these alternative motive technologies have strengths and weaknesses, we foresee that the motor vehicle market of the 21st century is characterized by a mixed motive power technologies with different technologies positioning different application segments.

An important question, based on the above-mentioned discussion, arises as to how such a vehicle technology mix is translated into an architectural mix of the future vehicle market, because these products’ architectures are likely to affect design-based comparative advantages of firms and regions. While existing literature and discourse tend to foresee that the shift from internal combustion engine to electric vehicles (EV) will result in modularization of the dominant products of the future (EV) and subsequently horizontal supplier structures, using analogies of such digital products as personal computers, we need to conduct a more careful systematic analysis of future vehicles of different technologies. For example, product architectures of series hybrid cars and parallel-series hybrid cars can be very different.

This study will be based on technological experts’ opinions about function-structure connections of each category of the future motor vehicles, as well as some propositions regarding product architectures, functional requirements and constraints: Other things being equal, a product with higher functional requirements and constraints tends toward more integral architecture.; Engineers of an integral and complex product tend to be more motivated to seek for modularization of its architecture for reducing their design coordination workloads; Modularization of a product, when the level of its functional requirements are unchanged, tends to force its modules in question to become more integral-inside; The existence of an integral-inside-integral-outside component (a complex and customized component) tend to make it easier for the engineers to design other components modular-outside (standardized or common parts).

**Chávez, A., & Lara A.:** Agents and government of the invention of electric vehicles

How to understand the forms of government in the inventive activity related to electric vehicles?? To answer this question, we have the patent information contained in the USPTO, 1976-2012 period. For this reason we study: i) the complexity, source and nature of technology; ii) agents (inventors, companies, partnerships, joint ventures, etc.); and iii) institutions (internal contracts, markets, intellectual property rights, etc.).

Some of the results are as follow: i) simple technologies are related to individual inventors; ii) the complex technologies are related to universities and research centers; iii) the company relate with simple and complex technologies. In addition, companies in partnership with other actors (universities, research centers or other companies) are related to complex technologies.

**Baba, T.:** Developing Model of Auto Parts in Emerging Economies: Comparative Analysis of the International Competitiveness of Auto Parts in Mexico, Brazil and India from 1990 to 2014

Developing Model of Auto Parts in Emerging Economies: Comparative Analysis of the International Competitiveness of Auto Parts in Mexico, Brazil and India from 1990 to 2014.
1. Introduction: Purpose and background of this research
It is very important matter for emerging countries of automobile production that reconstruction of value chain of auto parts for both production and R&D. In this study, the author would like to discuss the transition of international competitiveness of auto parts in Mexico, Brazil and India from 1990 to 2014 based on the developing model of auto parts.

There are two research questions, one is that “How is the international competitiveness of auto-parts in this progress of Auto-industry in Mexico, Brazil and India? “and the other is “Is correlation for developing economies between auto industry and its parts industry is positive or negative?”. Mexico, Brazil and India are countries of emerging auto industry. The production of automobiles in 2014, Mexico was 3365 thousand (7th in the world), Brazil was 3146 thousand (8th ), India was 3840 (6th) according to the OICA. In 2000, Mexico was 1936 thousand (9th), Brazil was 1682 thousand (12th), and India was 801 thousand (15th).

2. The developing model of auto parts in emerging economies
First step (DM Type1) : Competitiveness quite weak, dependence on import.
State: Some company started auto-parts production domestically by foreign or local companies. The rate of domestic procurement is quite low. Import: It is difficult to procure many parts domestically. They should depend on auto-parts import. Export: Export is quite limited except for global auto-parts shift in global companies.

Second step (DM Type2): Competitiveness weak to moderate, early stage of development of domestic auto-parts industry.
State: Domestic auto-parts industry developed to a certain degree. Establishment and technology transfer of/from foreign auto-parts companies advanced. It becomes able to domestically procure auto-parts needing a design and function peculiar to an own country, or parts not needed difficult technology to make. The other hand, it depends on import for foreign companies to procure parts needed difficult technologies and/or critical safety parts. However the number of parts increases to domestically procure, many of them might be lower price. Import: Though it depends on import to procure auto-parts needed difficult technology, import gradually decreased because of increase of local procurement. Export: Export gradually increases not only global parts transfer in global companies. Sometime, it may increase to export for after sales market by an advantage of low wage.

"Leaped Development”(3rd step pattern 1, DM Type3.1) : Competitiveness, moderate → strong, “Fortitude model ??”
State: It increased to domestically procure in many auto-parts. They may also expand export. R&D facility may increase by local or foreign companies backed increase of car production. Import: Import decreased except limited auto-parts. Export: Export increased in both for OEM and after sales market. Sometimes local or global manufactures advanced to another foreign countries and they may import auto-parts from here.

"Development Dilemma”(3rd step pattern 2, DM Type3.2): Competitiveness, moderate → weak, “Paper Tiger model ??”
State: Domestic procurement decreased because of such as wedge raising by economic growth or shortage of workers, technologies stayed sluggish, and so on. Import: Import increases. Export: Export decreases because of decrease of international competitiveness of cost or quality.
3. Analysis: Method and Data

The author sets up the development model of international competitiveness of auto-parts in emerging economies as shown in the Fig. He uses the “Global Competitiveness Index” (GCI) to analyse international competitiveness of auto parts. The GCI ranges from -1 to 1, with values close to 1 indicating strong international competitiveness and close to -1 indicating weak international competitiveness.

Analyzing GCI, he uses trade statistics, the 4-digit and 6-digit HS (Harmonized Commodity Description and Coding System). These auto-components include auto-tires, friction material, springs, gasoline engines, diesel engines, engine parts, ignitions/starters, lights/wipers, chassis, bodies and other automobile parts, and so on.


The aim of this study is to make an overall assessment of instrumentation in Sonora for the National Entrepreneurs Fund (FNE) as an approach to the evaluation of public policies implemented by the federal government at the state level to support and encourage technology innovation processes of metalworking SMEs. Such assessment follows the recommendation of the OECD (2007) to have as a guide the evaluation process objectives that the fund itself has set, as well as handling and instrumentation.

The analysis performed is framed on one side, in innovation systems approaches, in presenting the efforts of the companies, government institutions and institutions of higher education and research. In this case, it is about small metalworking firms in Sonora, the FNE implemented under the responsibility of the Federal Ministry of Economics and the University of Sonora, as a seat of researchers whose activities focus on innovation processes in the companies mentioned.

This analysis is framed, on the other hand, in a longer-range project that focuses on the analysis of business-government relations in the field of markets and industrial parks in the State of Sonora. This project ("Linking business-government: the policy of promoting technological innovation and its impacts on small businesses in Sonora") has support of CONACYT and is hosted by the Innovation and Sustainability Group work which, in turn, it is sheltered at the academy of Strategic Engineering from the Industrial Engineering Department at the University of Sonora.

The working paper contains an introduction where the objectives of the study regarding the analysis of public policies grouped under the National Entrepreneurs Fund in Sonora are established, also presents a characterization of SMEs and the role of productivity, competitiveness and innovation. As well as a description of FNE and its predecessor (the SME Fund) with emphasis on the operating rules, goals and objectives, including a description of the experiences in other states and how it has been implemented in Sonora. Several assessments made towards the SME Fund (by the Ministry of Economy, World Bank, Instituto Tecnológico de Estudios Superiores de Monterrey, El Colegio de Mexico, the Universidad Nacional Autónoma de México) are presented.

This analysis seeks to combine two methodological approaches; one called Six Steps to Heaven (6PP) of the OECD and developed by Storey, and the Logical Framework Matrix (LFM) as embodied in shaping Matrix Indicators and Results (MIR).

In addition, the different views that concur in the local innovation system are analyzed: of the federal government responsible for implementing policies, entrepreneurs as the main subject of supports and programs to promote innovation, and the conclusions of both academic approach according to the evidence found is used.

The findings fall into qualitative and quantitative root because different instruments are applied. The 6PP method has two parts, one of three steps that captures the perceptions of the beneficiaries of the program (which can be extended to an interpretation of the researcher), and another three steps is essentially quantitative. The MIR can be qualitative or quantitative.
The results allow us to reach different conclusions about the effectiveness of public policies FNE in Sonora, recognize their strengths and weaknesses, and identify areas of opportunity to improve their management and implementation.

Employment and labour relations: between segmentation and convergence


The Canadian automotive industry underwent significant changes between 2005 to 2014. Many of these changes were the result of the recession of 2008-09. The paper examines these changes in order to 1) provide a detailed profile of the Canadian automotive industry today, 2) profile the nature and extent of change in the Canadian automotive industry during this period, and 3) discuss the implications of these changes on the industry moving forward. It also comments on the shortcomings of using government data that relies on the North American Industrial Classification System (NAICS) when studying and profiling the complex automotive industry supply chain.

Data for the paper is drawn from a database of 21 Original Equipment Manufacturer (OEM) assembly and parts production facilities and 592 independent parts supplier plants that operated in Canada between 2005 and 2014. The database tracks information related to several variables, including parent ownership, nationality of ownership, location, employment, unionization, and product category (including NAICS codes reported to the Canadian government and qualitative descriptions of the product(s) produced at that plant). These variables are tracked over time and can provide both static ‘snapshots’ of the industry and longitudinal analyses of change over time.

The data illustrate several important changes in the structure and composition of the Canadian automotive industry between 2005 and 2014. The number of OEM assembly plants fell from 12 to 11, while the number of OEM parts production facilities fell from 9 to 6. OEM employment fell from nearly 48,000 in 2005 to just over 36,000 in 2014. Employment losses were concentrated at GM and Ford. Employment at Toyota, who added a production facility during this period, increased, and employment at Honda and Fiat-Chrysler remained relatively stable. Union density within OEMs decreased from approximately 80 per cent in 2005 to approximately 60 per cent in 2014. This is largely related to job losses at GM and Ford and increases at Toyota, which surpassed GM as the largest Canadian OEM employer in 2014.

The data also illustrate important changes in the structure and organization of the independent automotive parts manufacturing industry between 2005 and 2014. The number of independent parts supplier plants fell from 562 to 390, and employment in these plants fell from just over 128,000 in 2005 to 89,000 in 2014. Employment losses were concentrated among US-owned supplier plants, which employed over 38,000 people in 2005 and only 13,000 in 2014. Conversely, employment in Japanese-owned supplier plants increased from just over 10,000 in 2005 to 15,000 in 2014. Moreover, Chinese-owned independent parts suppliers, which had no operations in Canada in 2005, now employ approximately 3,600 people. Union density in the independent parts supplier industry also fell considerably, from 35 per cent in 2005 to 20 per cent in 2014.

The paper examines these changes through the lens of global production network theory (GPN). In so doing, it builds on research that draws upon GPN theory to examine industry restructuring at the continental or global scale. The paper also situates the Canadian automotive industry, which is concentrated in the province of Ontario, within its national context and within the Great Lakes cross-border region in order to examine the relationship between restructuring at the regional and continental scales. It also makes several empirical conclusions of interest to policy-makers and industry stakeholders. First, the economic impact of the Canadian automotive industry (measured in employment) is larger than government data suggests. Second, the composition of the industry changed considerably over the past decade, and Japanese-owned OEMs and parts suppliers play an increasingly prominent role in the Canadian industry, and Chinese-owned firms now comprise a substantial part of the industry. Finally, the paper argues against NAICS-based analyses of the automotive industry, which, due to the complexity of the supply chain and the likelihood that several important sub-sectors (e.g. glass, die casting, rubber) will be categorized in NAICS codes other than pertaining to motor vehicle parts manufacturing, tends to diminish its impact.

Among the car makers that faced severe financial troubles in recent years, PSA Peugeot-Citroën appears symptomatic of the needs for car makers to explore new frontiers (organizational, technological, geographical, etc.). While at the beginning of the 2000s, the direction was more than optimistic, planning a production of more than 4 Mio vehicles in the mid-2000s, the firm experimented on the contrary very hard times in the following years. Since 2005, production is declining, and the 2008 financial crisis did only accentuate the tendency that guided PSA towards restructuring since 2010. In 2012, when the firm made official its plan to close a plant in Europe, the analysis produced by the direction of the causes of the financial problems was crystal-clear: the growing competition and diversification in Western Europe on its core segments (A, B, and C segments), coupled with the lack of internationalization and the overdependence on Europe were the roots of all evil. In other words, the firm was not prepared to tackle the challenges of product diversification (especially SUV and crossovers) and of development in emerging markets.

This presentation, focusing on the trajectory of PSA since 15 years, aims at discussing both the growth model and the consecutive restructuring of the employment relationships entailed by such an analysis. How do financial downturn and consecutive productive internationalization impact employment relationships? Based on the observation between 2012 and 2014 of the restructuring plans of PSA, I will especially shed the light on the fact that if convergence of work organization at a regional, and even international level, is feasible, employment relationships are still grounded into national contexts. In turn, this situation creates the roots of some tenuous tensions between harmonized productive practices and context-bounded employment relationships. Moreover, the PSA case also constitutes a good mirror of the new growing principles of factory and HR management, and especially the outsourcing of expertise over work.

Pardi, T.: The future of work in the automotive sector: scenarios for mature countries

The automotive sector is undergoing major transformations concerning the geography of markets and productions, the nature of products, and the technologies embedded in cars or used to produced them. All these changes imply to different degree multiple processes of restructuring of the sector which have been also accelerated and exacerbated, in particular in mature countries, by the impact of the financial and economic crisis. The volume and the nature of employment as well as the quality of work in the sector are directly affected and concerned by these transformations and the related restructuring processes. In mature automotive countries one of the major stakes for national and supranational governments is to preserve factories and, in the longer term R&D centres, from the undergoing process of relocation towards low-wages countries, and also to reverse this process of relocation through different national and supranational industrial policies with a particular focus on innovation, both in products and processes.

The presentation will focus on the period 2000-2015 in order to asses the main trends in terms of employment and quality of work in the automotive sector in major TRIAD countries. A particular attention will be given to the impact of the crisis on the employment relationships at country and company levels and to the programmes deployed by national and supranational governments to preserve national automotive industries and their employment and to restore their international "competitiveness". On the basis of these analyses, the presentation will elaborate a series of scenarios concerning the evolution of employment and work under the current circumstances and policies, and will discuss the possibility of different (more favorable) scenarios and the strategies and policies that they would require.

This research is part of an undergoing study carried out by Gerpisa on the future of work in the global automotive sector for the International Labour Organization.
Martínez-Martínez, A.: Employees involvement and “observation”: a Lean tools for improving the effectiveness of Continuous Improvement Program in an auto-parts firm of Guanajuato, Mexico

The automotive industry recognizes Lean Production System as an effective methodology to promote incremental innovations that achieve goals such as, higher productivity, lower costs, etc. This industry has a long trajectory in the implementation of mechanisms to foster the quality and in activities that involve employees.

The purpose of this paper is twofold. The first one is to analyze the role played by the blue-collar workers in the successful implementation of the Continuous Improvement Program; and the second one is to examine the importance of “observation” as a Lean tool. The study also aims to analyze the influence of Toyota in the implementation of suppliers’ quality management systems.

This research draws from a case study of an auto-parts American plant located in Leon, Guanajuato, Mexico. The plant supplies automotive leather interior trim products. Field research was carried out in two moments: from August to September of 2012, and in June of 2015, through in-depth interviews applied to blue-collar workers, frontline-level managers, middle-level managers as well as top-level managers.

The main findings of the research are: a) the participation of the employees is crucial for the implementation of the Continuous Improvement Program, b) a robust “observation” allows employees to propose and implement incremental innovations in their job areas, these innovations allow the firm to increase productivity, reduce costs, reduce over-processing, among others; c) the established relationship with Toyota has allowed the firm to improve its organizational capabilities.

The paper is organized as follows. A global and brief explanation about the importance of the automotive industry in Guanajuato is carried out in the first section. In the second section, a literature review regarding continuous improvement, lean manufacturing and employee participation is provided. Methodological aspects are presented in section 3. Empirical results are presented and discussed in section 4. Main findings, research limitations and new research streams are summarized in the conclusions section.

Terrazas, C. P. J., & Alvarez L.: Worker creativity in the supply chain of the auto parts industry in Ciudad Juarez, Chihuahua

In the contemporary era of Globalization the role of workforce has significant implications for the firm competitiveness. The employee’s creativity as a part of the innovation process contributes to the generation of intellectual capital and improves organizational performance; therefore it has to be encouraged and harnessed. In the supply chain of the auto parts industry in Ciudad Juarez, Chihuahua, several examples of employee’s creativity are well known but there is little knowledge about employees' opinions on working conditions to stimulate creativity. The aim of this paper is to analyze the employee’s opinion regarding the ways in which second and third tier companies in the auto parts industry seek to foster creativity among its workers. We focused on three points: a) barriers, incentives and promotion practices to foster creativity, b) employees’ perception on work features and c) staff development policies that can impact creativity. This is a quantitative and transversal research. A survey by questionnaire was applied to a sample of 76 employees from seven auto parts companies between 2014 and 2015. Our main results show that workers considered routine and organizational goal opacity as the highest barriers while trust between workers and superiors, and teamwork promote creativity. Engagement and satisfaction could stimulate creativity but most firms don’t care about it. The task is challenging and keeps workers focused on the production and solving problem while the companies train the staff to make decisions and improve their confidence, however the work is so intense that they hardly have time to think about ways to improve it. Although the companies promote creativity among its workers the task within a systematized and standardized automotive production lines does not allow reaching expected results.
Janoski, T., & Lepadatu D.: Lean organizations in the advanced era of globalization - three types of lean production and their consequences for labor and inequality

Lean production has developed with four major parts: (a) taking a long-term perspective toward market share and hiring employees for the long term, (b) establishing a supply-chain network based on just-in-time-inventory, (c) developing an intensive problem solving culture that often stretches the workforce quite thin for the amount of work that needs to be done, and (d) using teams to their utmost while trusting all employees to make important contributions. There are three distinctive applications of lean production: (1) lean production-1 or Toyotism uses all four elements (the hard supply chain management and constant improvement, and the soft teamwork and trusting long-term employees); (2) lean production-2 or Nikeification uses items two and three but casts off items one and four by off-shoring or outsourcing its production to companies in less developed countries (LDCs) that do not use teams or long-term employment; and (3) lean production-3 or Waltonism involves merchandisers who exert a great deal of pressure on suppliers to produce the lowest cost item possible, and relying on off-shore production that is largely Fordist. These models of lean production are illustrated with Toyota for lean production-1, Nike and Apple for lean production-2; and Walmart for lean production-3.

The negative implications for lean production-2 and lean production-3 on the economies of advanced industrialized countries (AICs) are increasing unemployment in manufacturing with growing numbers of lower paid jobs in the service sector. This is also accompanied by a negative balance of trade. The negative implications for (Less developed countries) LDCs for lean production-1 and -2 involve the more intensive and exploitative application of Tayloristic/Fordistic work methods to manufacturing plants in China and Mexico. While lean production-1 results in more favorable and team-oriented work practices, it does have the major disadvantage of using temporary workers (sometimes as much as 30% of the labor force) who can be easily discarded (hence violating point one of lean production). In Mexico, we would expect to see the first model in the new Toyota and existing Honda plants (i.e., better working conditions and less inequality), and the second model in Ford, Chrysler, GM and Nissan plants (i.e., worse working conditions and more inequality). VW is a more complex model closer to but not the same as Toyotism.

Wenten, F.: Employment relations at global automotive subsidiaries in China and Mexico – converging or diverging?

This contribution addresses if, how and why the employment relations at a German car manufacturer’s subsidiaries in Mexico and China show signs of convergence or divergence. In particular, it will address how dynamics between managerial implementation ‘from above’ and workers’ responses ‘from below’ converge and diverge; and how this produces a related convergence or divergence in the performance of shop floor institutions and wider strategic company decisions.

The presentation is based on a recently completed PhD project on the constitutive role of local social and political conditions – especially the widely neglected agency of workers – in the transnational expansion and local adaptation of the enterprise. Qualitative interviews with blue-collar workers, trade union officials and managers, as well as participant observation at one Mexican and five Chinese plants was carried out in two six-months fieldwork periods in Mexico and China between August 2012 and September 2013. Additional interviews were conducted with relevant scholars, government officials and labour activists.

The presentation will proceed in three steps. First, based on fieldwork results patterns of convergence and divergence in wage systems, time regimes, techno-organisational aspects of the production process – and workers’ related grievances – will be presented in form of a static comparison. Second, convergence and divergence in the genealogy and functions of these conditions is explained from an agency-centric perspective focussing on industrial policy and the interaction of management and workers on and beyond the shop floor. Third, these insights are used to analyse causes and effects of more recent transformations in the company’s operations in both countries. This comparative historical perspective will
allow us to improve our understanding of current employment conditions in one of the largest global car manufacturers at the two most important locales for automotive production in the Global South.

**Wiemann, J.:** Export and Commercialization of German-Style Vocational Education. A Case Study in the Automotive Industry in Puebla, Mexico

German global players and ‘smaller’ transnational companies, carry out German-style vocational education and training activities at their worldwide destinations. This case study on the educational programs of the automotive industry located in the State of Puebla (central Mexico) aims at generating a deeper understanding of how and why the German apprenticeship model is exported to Mexico and implemented locally. The interaction between the companies and the institutional and organizational environment in which the multinational enterprises (MNEs) operate are analysed. We find that the three dual apprenticeship programs of Volkswagen, Audi and Schuler – although all located in the same institutional environment – show different degrees and different ways of adapting to the local environment.

**Gonzalez, P. W., & Godoy S. S. A.:** Automotive Industry in Mexico and China: Differentiated Roles in the Global Division of Labor?

During the eighties of the twentieth century began to show a growing process of relocation of manufacturing capacity of global automotive production from the traditionally dominant countries of this activity (US, Japan, Germany, France, Italy, Britain and Canada) to the developing countries or emergent economies (South Korea, Spain, Brazil, Mexico, Taiwan). In this process, although differentially during the last decade of this century China and Mexico have scaled substantially its position in the global automotive context. China's global expansion in the automotive sector has been conceived by governments, companies and unions around the world, as a new predatory competition phase for the automotive industry, affecting both developed and developing countries.

In the case of Mexico, the rise of China could establish a serious threat to the automotive industry because it could affect not only the domestic market but also the global attracting investment and competition in third markets like the United States, the main trade partner of Mexico. Given these events the questions arise: What are the roles that Mexico and China play in the global division of labor in the automotive industry ?; Do they keep the automotive industry Mexico and China a situation open for competition in the global arena, or is there any room for complementarity between them? These questions are the focus of the work to develop.

**Forbes, A. R.:** The Power to Converge: New Apprenticeship Models in the U.S. South and Mexico

The massive restructuring in the 1990s of manufacturing firms in North America undermined the social contract between employers and workers, exposing employment relations to market forces (Cappelli 1999). My own research shows that since the 1990s, some individual automotive firms and small automotive clusters have made aggressive attempts to restore the employment contract with certain types of workers—low- and mid-level technicians—through the practice of apprenticeship in the US. South and central Mexico.

Because these trends seem to have important regional context and reach, they highlight the potential for regional divergence. Additionally, because these apprenticeship programs are focused on only a segment of the workforce and operate without representation from organized labor, they also would seem to exacerbate labor market segmentation within the automotive industry. However, emerging patterns of program replication and policy diffusion suggest that the practice of apprenticeship might, with the support of the public education sector, become incorporated into a more broadly applied inclusive training and employment policy.

Smaller multinational firms, particularly those from Germany and other European countries with strong vocational training systems, are central to local program development. To understand the context for their investments in
apprenticeship in the U.S. South and central Mexico, it is important to how small firm power is enabled by position in
global supply chains, relationships with other firms, and relationships with other local and global organizations,
particularly institutions of public education and technical training.

The Global Value Chains (GVC) literature has demonstrated that strong lead firms in producer-led GVCs like the
automotive industry have considerable market power to leverage in negotiations with suppliers and an important role in
the diffusion of labor standards (Barrientos, Gereffi, Rossi 2011). Workforce development systems in the U.S. are often
assumed to be a byproduct of large firm influence, and scholars of political economy have suggested declining firm
size will undermine opportunities for states and localities to develop and sustain robust training and skill development
infrastructure (Berger 2013). Scholars of economic geography have noted the overwhelming power that large firms
have over smaller firms in shaping workforce development systems (Christopherson and Clark 2007: 1224; Markusen
1996: 302-303). But what these scholars fail to recognize is that smaller firms, particularly small multinational firms,
have been more dependent on those systems and, through their engagement, have introduced innovations to service
delivery that might actually have had a greater influence on system development.

While we know that smaller firms can contribute to innovative and sustainable industrial clusters of various
configurations (Piore and Sabel 1984; Markusen 1996), we are missing an understanding of how those systems develop
and change due to small firm influence on institutions. Even when firms do have access to lead firm knowledge through
contracting and other interactions, OEMs “cannot internally create all of the various capabilities needed for global
competition” (Contreras & Carrillo 2010: 25). Alternative mechanisms for knowledge transfer, such as technical
training programs, also inform upgrading and skill development processes in GVCs (Ramirez & Rainbird 2010: 699).
In their paper on GVC interventions in Latin America by international organizations, Pietrobelli and Staritz encourage
GVC scholars and practitioners: “to consider the potential role of the involvement of lead firms and first-tier suppliers/
intermediaries, and the importance of innovation systems and local learning efforts to enable upgrading processes
within GVCs,” (Pietrobelli and Staritz 2013).

The appearance of new apprenticeship programs in the U.S. South, Mexico and throughout the Americas has occurred
through various pathways of policy transference and program adaptation at the sub-national level. Therefore
subnational or regional studies are important to understanding these trends. While new local apprenticeship programs
are small in scope, their development calls attention to how small multinational firms are shaping local training and
education programs as they seek strategic labor market advantage.

This paper describes how different forms of power may constrain and enable investments in regional labor markets and
how spatial configurations, such as the co-location of lead firms and supplier networks, may have informed the
possibilities for change. Relational networks between firms and non-firm actors, such as the government and
educational organizations, help explain changes in worker training and education better than an analysis of markets and
firms alone.

In this paper, I highlight a couple local apprenticeship programs against a backdrop of detailed information on a variety
of training and education activity in specific sub-national regions/states in the U.S. South and central Mexico since the
1990s. I rely on secondary sources (news articles, meeting reports, policy reports) and data from semi-structured in-
depth interviews to construct the local history of apprenticeship program development. I conducted 53 interviews in
August 2014 and July 2015 in the central Mexican states of Mexico, Puebla, Tlaxcala and Guanajuato. The majority of
the interviews and observations took place in Puebla, Mexico. Interviewees were identified through a snowball
sampling method, beginning with prominent organizations. Twelve interviews were with staff at OEMs; 11 with staff at
suppliers; eight with industry or employer associations; seven with public universities; six with private universities;
three with state officials; two with private training providers; four with other experts. Similar studies are underway in the U.S. states of Tennessee and South Carolina.

**Arteaga-García, A., Flores A. M., & Ramos C. H.:** Unionims, labor relations and the financial earnings.

Research question: Which factors located in the financial sector affect in the rapid growth of installed capacity and in the impact of this growth on the dynamics of employment and labor relations settings, associated with the role of corporate unionism in the automotive industry?

Methodology: We assume the change of capital reproduction pattern observed in Mexico since the early eighties and one of its main features: its specialization as "exporter secondary." This condition is derived from the role of export platforms that transnational companies assigned to their subsidiaries in Mexico as part of their competition strategies at the global level. Assurance that role was founded on building competitive advantages which would ensure profits in the medium and long term. A strategic advantage has been the industrial relations system built within the auto industry. This system is characterized by securing labor pax based on a corporate union control scheme, which guarantees low wages and high productivity and quality. Ensuring high profitability of production, derived from its orientation to the world market and from marketing practices and financing schemes set in Mexico, allows us to infer that the operation of the financial subsidiaries of transnational corporations contribute to the channeling of resources to the parent automotive companies to meet their debt obligations in their home countries.

We conducted an empirical analysis of the financial variables of parent transnational corporations with production and marketing activities in the automotive industry in Mexico; five case studies were taken: Chrysler, Ford, Volkswagen, Nissan and General Motors. Based on this empirical analysis, we propose an approximation of the financial factors affecting the determination of the installed capacity rapid growth and its impact on the dynamics of employment and on the labor relations settings, all this associated with the role of corporate unionism; for this, it was also necessary to analyze the hiring variables of the considered corporations.

Result. The competitive advantage generated from the strength of abundant and skilled labor existing under a corporate union system, is a key feature that allows conditions in the productive sector of the subsidiaries are guaranteed to cover needs and contribute to the achievement of goals located in the financial sector of the parent TNC; that is, for the generation and appropriation of financial income that will contribute to debt repayment (financing Ponzi schemes).

The analysis of these financial variables of TNCs allows us to propose that the expected gains affect the determination of the characteristics of productive structures and their impact on the dynamics of employment, labor relations and on the establishment of corporate unionism in subsidiaries of automotive industry TNCs. The execution of financial activities (auto financing, mortgage and banking, among others), the existence or not of an own financial institution, the conditions required for the generation and appropriation of financial income in capital markets, and the use of these resources to repay financial debt, are identified as major factors that shape the global operation strategies of automotive TNCs.

**Calderon, O., Robles A. C., Estrada Cerón B. A., & Salcido González R. S.:** Labor relations workers confidence in four transnational auto parts companies in the state of Puebla, Mexico.

The labour relations in automotive industry of Latin America has been studying traditionally about worker and employer, but, what about ‘trusted employee’ who not called workers for the mechanisms of administration of their employ but about functions they do? It is explain about identity terms, their relations and labour conditions. The methodology used for this research is quantitative; a representative random sample of four transnational auto parts companies that are located in the city of Puebla, applying 100 questionnaires with closed questions was made. The results found a high degree of identity employees to their work and their company, in a direct relationship with their working conditions.