THE INTEGRATION OF THE MEXICAN AUTOMOBILE INDUSTRY TO THE U.S.A. : BETWEEN POLICIES AND CORPORATE STRATEGIES

Jorge Carrillo

INTRODUCTION

The automotive industry in Mexico (hereinafter IAM) has undergone a profound transformation since the beginning of the eighties, first in a stage of transition between the industrial model of import substitution focused on the internal market and the current industrialization model centered on the external market (Carrillo, 1993; Hernandez Laos and Aboites, 1993; Mortimore, 1995), and later as a stage of consolidation, production specialization and increased international competitiveness of manufactured exports in the nineties. During this process, the automotive sector has played an exemplary role by presenting itself as (a) the model to follow within the exporting sector both because of its aggressive policy of international market penetration and the increase in its competitive capacity (Mortimore, 1995; Carrillo, Alonso and Mortimore, 1996; Bayón & Bensusán et al, 1997)[1] and (b) the industrial reorganization model (technological, organizational, spatial and labor) (Carrillo, 1993). This restructuring and modernization process of the IAM preceded by more than a decade the economic integration derived from the North American Free Trade Agreement (NAFTA) in force since 1994.

The profound transformation of the IAM was mainly reflected in a market reorientation towards exportation and its integration with the United States market. While in 1975 less than 1% of vehicular segments were exported, in 1980 four out of every 100 units produced left the country, by 1985 12 units, in 1990 34 units and by 1997 the export figure rose to 74 of every 100 units (AMIA, several numbers). Of this last figure, approximately 80% go to the United States. In second place, has

[1] The work of Bayón & Bensusán et al, 1997 will be referred to at several points in this text since it is an extremely updated document that summarizes a great deal of the literature and labor debate on the automotive industry in Mexico.

been a process of modernization and opening of new plants, through production specialization in certain types of automobiles and autoparts, territorial specialization forming semi-clusters, the incorporation of new technology and the adaptation of new forms of labor organization. Finally, in third place, labor relations have changed profoundly in terms of flexibility and decentralization.

COMPETITIVENESS AND PRODUCTIVITY

Automotive Exports and Productivity

The recuperation, expansion and transformation of the Mexican automotive industry has been spectacular and represents the most vital aspect within the process of structural adjustment, economic reorientation and improvement of Mexico's incorporation into the new international industrial order (Carrillo, Mortimore, Alonso, 1996).

The early and far-reaching restructuring to which the IAM has been subjected since the eighties was reflected in a strong increase of its production capacity, with production volumes growing 338% between 1980 and 1997 (AMIA).[1]

During this process, the industry has had to confront three explicit and interrelated challenges. First of all, to recuperate from a devastated market associated with the Mexican debt crisis of the first half of the previous decade, which produced a dramatic decline in domestic vehicle demand. In 1989, total vehicle sales had finally surpassed the 1981 level.

Secondly, for automobiles produced in Mexico to become internationally competitive, with the aim of transforming the industry into an exporter. By 1994, precisely along with NAFTA, vehicle exports exceeded domestic sales. And third, to overcome the economic crisis of the end of 1994, when the domestic market experienced an unprecedented collapse: sales plummeted from over 520 thousand units that year to slightly more than 150 thousand in 1995 (or 71%), falling to its lowest level since 1971 (Bayón & Bensusán, et al, 1997). As of 1996 there has been noteworthy recuperation in terms of both production for the domestic market (around 113% between 93 and 97), although still not reaching 1994 levels, and that aimed at exportation (about 38% for the same period). (Table 1)

The IAM has gone through four separate stages during the last 20 years. They may be described as the import substitution *boom* from 1978 to 82; the crisis period and reorientation of 1983-87, during which sales declined but new and modern plants were built; the stage based on export expansion from 1988-93, in which sales dropped considerably; and the NAFTA era, when exported units, autoparts and motors for export took over the major role in the industry. The performance of the IAM clearly shows a cosiderable upswing in production, exports and participation in the North American market.

The same can be said about export evolution, which has differed for each automotive product, as specific products have predominated and gone through different stages within the export model. While during the 1979-85 period motors grew at a rapid pace (motors continued to be the top automotive export product until 1988), since 1989 the production of vehicles for human transport has maintained first place in exports, with surprising growth since NAFTA. Taking the expansion of auto exports (58.4 thousand in 1985 and 918.7 in 1997) together with that of motors (2.2 million in 1990 and 2.8 in 1997), we have a significant element of structural change in the recent industrialization process in Mexico (Carrillo, Mortimore and Alonso, 1996). In the case of autoparts, their relative participation increased considerably after 1991.

Finished units now comprise the greatest percentage of export value, having gone from 75% in 1985 to 50% in 1995. It is certainly worth noting that production of cargo vehicles also rose from 1.5% to 12% during that same period. As for auto parts, they maintained slow growth until 1991, when the pace quickened. In 1990 they made up nearly 7% of exports, which, by 1995, became 15% (18% together with the 3% for motor parts). In the case of motors, steady growth took place throughout the eighties and once again between 1994 and 1997. Nonetheless, in relative terms they went from representing 64% of total sector export value in 1985 to 14% ten years later.

Regarding efficiency in the automotive sector (productivity and quality), the new motor and vehicle assembly plants have achieved, and in

[1] Data provided by the Mexican Association of the Automotive Industry is used here as in most bulletins of different associations.

some cases surpassed, the standards set by North American companies, including the Japanese transplants to the United States (Carrillo and Ramirez, 1997; Harbor Report, 1996; Osawa, 1996; Shaiken and Hersenberg, 1990).

During the import substitution *boom* (1978-1982), productivity went down in the automotive industry. Using 100 in the year 1980 as a base and measuring in thousands of pesos, labor productivity decreased from 522.4 in 1979 to 494.1 in 1982 (Cimex-Wefa, 1989). In other words, in the OEM industry, 4.1 vehicles were produced per employee in 1979 and 3.0 in 1982, and in the auto parts industry, average productivity during that period was as much as two times lower than in the assembly plants (Cimex-Wefa, 1989).

In the export development period, that is from 1988 to 1993, according to INEGI (National Institute of Statistics, Geography and Computerized Information) calculations, the manufacturing industry experienced a 13% increase (7% more than the total index) and the automotive industry, 9% growth during that same period. (Table 2). This indicates that productivity in the automotive industry as a whole has followed a similar pattern to that of manufacturing (Bayón & Bensusán, et al, 1997). However, upon reviewing the different branches of automotive activity, certain substantial differences are seen. In the first place, automobiles have increased more, in the neighborhood of 67% between 1988 and 1993.[1] Second of all, rubber products have grown a moderate 4.5%, and thirdly, motors and auto parts productivity together has declined 18%. (Table 3).

In the current NAFTA period, that is, as of 1994, productivity has increased to a much greater degree: the overall automotive industry (branch 3841) raised its productivity 62% in contrast to 28% in the manufacturing industry(Table 4) . Table 5 shows that upon comparing the main economic indicators of the automotive and manufacturing industries as well as the metal manufacturing division, we can see that between January 1994 and May 1997, the value of production and especially productivity grew more in the area we are analyzing than in metal manufacturing and substantially more than in manufacturing. It is curious that at the same time and consistently with these figures, it was the automotive industry that lost more jobs and lowered compensations the most.

In the case of the *maquiladora* auto parts industry (that is auto parts plants under the *Maquiladora* Decree), there has not been a substantial increase in productivity. With 1980 as the 100 base, there was no growth in 1985, in 1990 it was 11.5% and in 1995 3.7%, although it is expected that this will go up by about 60% by the year 2001. Although productivity dynamism is low, *per capita* value added volume is very high: $8,253 thousand dollars per employee in 1980 and $8,559 in 1995, with the expectation that it will reach $13,250 thousand dollars in 2001.

Despite the productivity increase in the automotive industry as a whole, growth levels have varied a great deal. Taking into account the degree of productivity evolution, three groups may be formed. The first, with a very high productivity level, encompasses branch 384110 (automobile and truck manufacturing and assembly), since it rose 93% between January 1994 and May 1997, followed by branch 384126 (manufacture of other parts and accessories for automobiles and trucks), up 76%. The second group includes the branches with mid-level productivity, beginning with 384123 (manufacture of parts for the transmission system of automobiles and trucks) with a 22% increase; branch 384124 (manufacture of parts for the suspension system of automobiles and trucks), up 20%; branch 384125 (manufacture of parts and accessories for the brake system of automobiles and trucks), which rose 16%, and finally, branch 384122 (manufacture of motors and their parts for automobiles and trucks), with 9% growth. Lastly, we have the group with negative productivity: branch 384121 (manufacture and assembly of bodies and trailers for automobiles and trucks) diminished its productivity 18% during the NAFTA period.

Structure of the Automotive Industry

The automotive industry production chain is made up of four large product segments: the raw and basic materials supplied to both producers of major components as well as those of sub-assemblies, and OEM plants. These segments may be seen in Figure 1. In addition to the production chain, there are other segments such as research

[1] According to Bayón & Bensusán et al. (1997:17) this increase was the result of the introduction of new forms of job organization along with a strong intensification of work rhythms and the excessive use of extra hours, in both the assembly companies and the major autoparts suppliers.

and development, marketing, distribution and post-sale services.

Currently the IAM has eight vehicular firms within the OEM segment (BMW, Chrysler, Ford, GM, Honda, Mercedes, Nissan and VW), which in turn have approximately 20 plants in 11 states around Mexico. There are 600 auto parts companies and over 1,000 agencies in the distributor segment (Bancomext,1996).

Traditionally the production segments that have been considered as the most important within the IAM are (a) the assembly (or OEM) plants and (b) auto parts.

The assembly plants manufacture or assemble complete units of vehicles for people or cargo. It is common for these plants to also produce components, as in the case of motors in Ford Cuautitlan and Volkswagen in Puebla. This small segment of firms and plants maintains a high volume of employment and, above all, has achieved significant concentration in production and export value. Since the beginning of the eighties, the OEM industry has increased the number of plants, makes and models. Vehicle production in 1975 (without counting light and heavy trucks) was carried out by five firms which exported six different models of cars. In 1997 there were still five firms, but the number of export models had risen to 18. This indicates that despite the enormous growth in exports shown previously, a significant degree of vehicular specialization continues. Production for the domestic market is quite a different case, since in 1997 8 firms in Mexico were producing 6 different types of products, over 30 models of cars and 29 models of light trucks.

As for auto parts, this segment is comprised of many more companies of varying sizes, technological levels, products and production volumes. This heterogeneity, along with a greater variety in terms of capital origin and position in the production chain (first-line, second-line, etc. suppliers), leads to considering this to be a much more complex and heterogeneous segment with greater challenges and opportunities for achieving more balanced regional-production development.

It is estimated that there are 600 auto parts companies in Mexico, of which 34% are subsidiaries of foreign corporations, mostly of the “Big Three”, and the remaining 66% is made up of national companies. The presence of non-American, particularly German and Japanese, foreign investors, however, has increased substantially as of NAFTA.

In 1996, according to Bancomext, of the total number of suppliers, 300 were first-line (motors, transmission and panel instruments all operating as full service suppliers), 300 second-line (brake components, absorbers, lamps and shocks) and 50 third-line (basic processes and complementary parts such as stamped parts, casting parts and nuts). According to this institution, by the year 2001, there will be 480 first-line suppliers, 130 of which will be new plants with foreign capital and 50 with national capital. Furthermore, there will be 1,000 second-line suppliers including 350 new foreign companies and a similar amount of new local firms. And of the 600 third-line suppliers, 50 will be new foreign companies and 500 domestic. All told, in the three lines within the chain, there will be 2,080 suppliers, in other words, 246% more establishments than in 1996.

The subsidiaries of mainly American, German and Asian transnational companies produce as much for the internal market as for export, although there is a clear tendency to concentrate their production on exports destined for the United States (due to the scale of this market, geographical location of Mexico and NAFTA). For example, of German first-line suppliers that supply German assembly plants, 10 companies designated 41% of their production for export in 1997, basically to the U.S. [SECOFI (Secretariat of Commerce and Industrial Development), 1997] – only 3 plants do not export. It should be pointed out that these are firms that basically arose out of the IAM decree in 1962 and that it was not until the beginning of the nineties that exports started, following the pattern of the OEM plants.

Within this segment of foreign branches are the *maquiladora* auto parts plants, companies that are under the Decree of the *Maquiladora* Industry and are thus called this. They also deserve special attention because of their volume, great dynamism and industrial upgrading (Carrillo and Hualde, 1997).

The *maquiladora* auto parts plants were established along the northern border of Mexico at the end of the seventies. In 1980, there were 53 plants, which generated 7,500 jobs and an added value of 61.9 million dollars. During the eighties and thus far into the nineties, their expansion has

been tremendous, having grown 19 times in terms of added value and 18 times in employment, between 1980 and 95. Between 1995 and the year 2001, it is predicted that added value will triple and employment double. In 1997 there were 202 establishments, furnishing 186,430 jobs and 1 billion 752 million dollars in added value.[1] Their importance is such that today four out of every ten auto parts establishments in Mexico are *maquiladora* plants and four out of every ten jobs are within the automotive sector – 5 of every 10 in auto parts (SECOFI, 1997).

The *maquiladora* plants belong to different types of firms: branches of transnational companies like General Motors and Ford; subsidiaries of large corporations such as Yasaky, Bosch, ITT; subsidiaries of small concerns; and even subsidiaries of Mexican companies. Most of the employment is found within the transnational subsidiaries, whether assemblers or auto parts (as in the case of Delphi). Twenty-nine percent of the *maquiladora* establishments in 1995 ran on domestic capital, 65% with capital from the United States, and the remaining 3% came from several other countries (SECOFI, 1995).

In terms of domestic auto parts firms (not *maquiladoras*), there are around 100 large and 330 small and mid-size companies. The large companies …comprise 13 national industrial groups {for example, Tremec, Spicer, Vitro} which, generally speaking, have technological alliances and joint ventures with foreign companies, control about 80% of sales in Mexico,… {they do not compete among themselves because of their highly specialized production} …, cornering almost the entire internal market… (Bayón & Bensusán, et al, 1997; Eden et al., 1996; Bueno et al., 1996). These are mainly first-line suppliers that sell original equipment (OEM), stock OEM plants and maintain low participation in the spare part market and a small number of suppliers, many of them belonging to the same firm.

Therefore, the large domestic and foreign auto parts companies that have been able to form strategic alliances or sign long-term contracts with assembly plants, have greater possibilities for growth and increasing international competitiveness, given that their size allows them to develop economics of scale and that they have greater access to new technologies.

Small and mid-size companies produce for the internal original market as well as for the spare part market, and ...they have serious technological and financial limitations to entering the international market… (Bayón & Bensusán, et al., 1997).

In general, it is fair to say that the capacity of the auto parts industry in Mexico has been affected by the decrease in the domestic market to which its production has been oriented since the sixties. The internal market for automobiles and parts, both original and spares, has suffered a huge reduction. The tendency toward diminishing production destined for the internal market got much worse at the time of the 1994 crisis. Auto parts companies experienced a sales drop of 55% in original equipment and 21% in the spare part market. (Bayón & Bensusán, et al., 1997).

Along with the plummeting automobile and auto parts domestic market, the situation has been aggravated by the fact that some imports have increased their presence in Mexico, particularly spare auto parts. The value of parts for vehicles and trucks went up from 9% to 41% between 1990 and 1995, and for motor parts, it grew from 3% to 10.5%.[2]

Thus it is evident that the auto parts industry offers a much more heterogeneous, complex and unfavorable panorama than that of the OEM industry, not only because of the greater variety of products and company sizes, but because of the advantages of small establishments. Within the framework of a highly competitive setting, one of the factors that most affected Mexican auto parts companies since the end of the eighties was the need to comply with international quality standards, since low product quality was one of the major problems resulting from the policy of import substitution focused on the internal market and strongly protected by the state. This situation was exacerbated by the contraction of the domestic market and the opening up to importation.

This is what authors like Bayón & Bensusán, et al. (1997) refer to when they mention that Mexican auto parts producers are presently in a doubly subordinate position:

In the first place they are dependent on the transnational assembling companies. They confront

[1] Data taken from the INEGI and CIMEX-WEFA, several years.

[2] The value of imported assembly materials for automobiles decreased substantially, from 67% in 1990 to 8% in 1995.

two kinds of efficiency-related constraints at the same time: first, given the incorporation in assembly plants of lean production techniques, the demands regarding costs, quality, timely delivery and services become much more stringent. And secondly, NAFTA has subjected those suppliers used to a protected market, to tough competition with foreign suppliers around the world. (Bayón & Bensusán, et al., 1997:17).

Auto parts companies within the framework of NAFTA thus face serious obstacles, especially in those small establishments, inasmuch as they suffer from problems due to size, from an historically protected and now devastated and sought after market, and from technological limitations.

The previous situation is completely different in the case of auto parts for export, *maquiladora* plants particularly. They have considerably increased added value – as has already been explained –, expanded their participation in the North American market (going from 1.3% to 5.9% of total Mexican exports to the OECD between 1980 and 1993), and generated considerable employment (the average of positions per plant went from 141 in 1980 to 923 in 1997).

The Role of Transnational Companies

The automotive industry in Mexico has been heavily dominated by foreign capital since its inception. By the end of the eighties 99% of automobile production, 97.6% of motors and 71.3% of auto parts belonged to transnational corporations (Rosell and Viladomiu, 1994). Their presence has been strengthened by the opening of new plants, first for motors and later for components and automobiles. As of the beginning of the eighties, new motor plants were extremely successful in introducing modern technology (Shaiken and Herzenberg, 1987; Moreno, 1988). The experience of assembly plants was quite similar (Shaiken, 1990; Womack, et. al, 1990; Krafcik, 1988). This success coincided with the introduction of new corporate strategies originating from the headquarters of American producers operating in Mexico (GM, Ford and Chrysler), spurred on to defend the domestic market from penetration by Japanese imports and other producers. The transnational corporations came to the conclusion that Mexico could turn into a low-cost export platform for small, 4 and 6 (mainly 4) cylinder cars (Mortimore, 1995).

The profound transformation of the IAM – mentioned previously – was fundamentally due to investments by the North American "Big Three" and the growing specialization in their production. With the aim of facing Japanese competition, these companies opted for Mexico due to its low salary costs and geographical proximity, as well as a highly favorable political context afforded by the support of the Mexican government's macroeconomic policies.

Thus, the strategy of consolidating and expanding the Mexican market shifted to seeking efficiency in their direct investments (Carrillo, Mortimore and Alonso, 1996). With respect to production specialization, the production and exportation of compact and subcompact, 4 and 6 cylinder cars with specific types of motors and a limited number of auto parts – such as harnesses, upholstery, mufflers and exhaust pipes – have benefited. Likewise, plants are specializing in a sole model - Escort in the case of Ford, Cavalier at GM and Sebring at Chrysler (Carrillo and Ramirez, 1997).

The competitiveness of Mexican assembly plants, including General Motors ($4,602 million dollars in sales), Chrysler ($3,923), Ford ($3,170), Nissan ($1,537) and Volkswagen ($1,249), is such that in 1995 they held sixth, seventh, twelfth, twenty-fifth and thirty-second place, respectively, in the list of the top 50 firms operating in Latin America (America Economica, 1996-97) (Mortimore, 1997).

The "Big Three" American companies were the ones that expanded their production operations most in Mexico, making their main market that of exportation (U.S. Congress, 1992). These firms represented more than 70% of all the exports during the stage based on export expansion. By 1993, they all had export propensities of close to 60 percent. Meanwhile, the non-American companies (VW and Nissan) concentrated their operations on sales within the domestic market, comprising together over half.

In other words, the original transformation of the IAM, in terms of international competitiveness, was clearly an undertaking of the American "Big Three" automobile producers. Nevertheless, that situation has changed for the rest of the firms. Today, except for the recently-established Mercedes-Benz, BMW and Honda plants, which

only cater to the internal market,[1] all the assembly plants maintain a high export tendency. In November 1997 the percentage of exported units in the three American assembly plants reached 71%, in Volkswagen 61% and Nissan 53% (AMIA).

The advantages derived from participation in Mexico and especially from NAFTA, were reflected in several investment projects launched by Chrysler, GM and Ford, amounting to one billion dollars in 1994. The rules of origin contained in the Free Trade Agreement (62.5% North American content) inspired investment projects by non-American companies (Nissan and VW) of around 1.2 billion dollars, aimed at expanding and consolidating their local supplier networks. These direct foreign investment figures, apart from the ten billion dollars invested during the eighties, are proof of unprecedented growth of the sector in Mexico. (Carrillo, Mortimore and Alonso,1996).

INDUSTRY REORGANIZATION AND CLUSTER FORMATION

Localization and Specialization

The IAM is located in a wide variety of cities and regions. During the import substitution period, large urban areas (Mexico City, Monterrey and Guadalajara) and their surrounding cities (Puebla, Toluca, Cuernavaca, Saltillo) profited in terms of OEM and auto parts plant localization. The explanation for this was that these plants were focused on the internal market, and a large part of that market lives in these cities. Also the available job market was more suitable. The crisis and reorientation period benefited cities in northern and central Mexico (Chihuahua, Ramos Arizpe, Torreon and Aguascalientes), as well as border cities, with the establishment of first generation *maquiladora* plants (Carrillo and Hualde, 1997). With export development, other cities, such as San Luis Potosi, Monterrey, Silao, etc., joined in the automotive crusade. By now, most of the Mexican territory, from Puebla to the northern border, is covered by different types of automotive enterprises. It can generally be concluded that production specialization and territorial specialization have gone hand in hand.

Ford (in Chihuahua, 1983 and Hermosillo, 1986); General Motors (in Ramos Arizpe, 1981 and Silao, 1994); Chrysler (in Ramos Arizpe, 1981 and 1994); and Nissan (in Cuernavaca, 1978 and Aguascalientes, 1984 and 1991) moved towards the center and northern zones. Along with the opening of these plants, from the end of the seventies, a noteworthy increase in *maquiladora* auto parts plants (mainly GM and Ford) on the northern border was produced. Concurrently, some of the oldest plants, such as those of Ford in La Villa in 1982 and Tlalnepantla in 1986, Renault in 1986 and the General Motors Federal District plant in 1995, were closed down. Volkswagen is the only assembly firm that did not resort to geographic dispersion.

Northern Mexico thus rapidly developed in the field of exports during that first stage of the export substitution model. While exports from this area were insignificant at the start of the eighties, by 1996 they amounted to 31% of cars and 63% of motors produced in Mexico (Ramirez, 1997:32). The new spatial division prior to NAFTA was mainly reflected in new regional specialization patterns. The northern plants produced 4 and 6 cylinder motors and small cars using greater amounts of automatization and more highly skilled labor, in addition to auto parts such as harnesses, and all for export. In contrast, the plants in the central region -except Aguascalientes- produced 6 and 8 cylinder motors and freight trucks, above all for the domestic market and with a greater degree of regional integration. This situation changed significantly with the trinomial trade liberalization, internal market crisis and restructuring of the companies in the brownfields (Ford-Cuautitlan, Chrysler-Toluca, Nissan-Cuernavaca, VW-Puebla), which initiated and activated the export platform in the pre-existing zones.

The process of opening new establishments in areas called greenfields and of restructuring old plants was accompanied by a new specialization and production complexity process. A similar process to that in the export assembly plants and motor plants can be observed in auto parts. In a 1996 survey of 12 auto parts plants, it was found that both in foreign transnational corporations and Mexican plants, companies have followed the strategy of specializing in one main product. This product accounted for 68% of total production

[1] The production of these three companies is very limited: 100 units monthly on the average in November 1997 (AMIA).

volume in 1995, in a sample of 12 plants.[1] Specialization may be even greater in *maquiladora* plants, many of which only produce one product. This is the case of car seats and electric cables (harnesses), as well as in highly specialized plants, such as paint plants.Everything indicates that the strategy of the transnational corporations has been the localization in Mexico of highly specialized establishments. According to this survey, however, once the companies demonstrate competitiveness, a more complex process of production and employment expansion begins.

A central feature of the IAM is that it specializes in labor intensive processes (approximately 80% of personnel occupied is made up of production workers). This has a territorial and historic explanation which goes beyond corporate strategies: Mexico shares a 3,200 km.-long border with the United States, with plentiful, young manual labor, ten times less expensive than on the American side.

The specialization in labor intensive processes does not necessarily mean that the transnational corporations in Mexico are specialized in the production link characterized by low classification and technology and that their immovable fate is to assemble simple processes with cheap manual labor. Although this view persists in several circles (see U.S. Congress, 1992), and it is partially correct, the production and labor reality of the different segments of the IAM is far from being homogeneous and simple in these terms.

According to the opinions of managers interviewed (see footnote 7), the manufacturing they carry out is ever more complex in its process due to technology and production of diverse models. Therefore, even in assembly processes, there is greater sophistication. A good example is the electric cable or paint companies. The harness (electric cable) industry is considered in the literature to be the most conspicuous example of massive production with unskilled labor and no technology.

However, in 12 companies visited (see footnote 7), it was found that for each car, cables of varying sizes, thickness and finishes are required in accordance with the different models and versions.

For example, one firm produces annually different sets of electric cables that are required for the 250 thousand Chrysler cars, including a wide range of models. Another example is a low-baked, domestic paint plant, which though it has an automated process to produce the more than ten tons required by its customers (meaning a high level of quality demand), it is manual labor intensive in order to offer the best post-sale services (of customer training).

In conclusion, it may be pointed out that the strategies of the three American corporations, mainly, led to production transformation in Mexico, via construction of new plants and restructuring of pre-existing ones, so that they could be integrated into the North American production system (Ozawa, 1994). From this viewpoint, the IAM changed the strategy of seeking a market for that of seeking efficiency in direct investments, which was achieved in great part thanks to industrial relocation in greenfield zones in the center and north of Mexico. In other words, due to the scanty trade union tradition, the abundance of inexpensive manual labor and lower unit costs in regions like the border states, heightened flexibility in internal labor markets could be developed to such an extent that managers could perform the necessary adjustments faced with fluctuating demand and constant pressures to raise efficiency in the companies.

Technological-Organizational Development

Available evidence from the beginning of the nineties on technology transfer and new organizational practices (de Maria y Campos and Lopez, 1992; Shaiken, 1990; Carrillo, 1990) suggests that, in terms of productivity and quality, the new production plants in Mexico have reached the standards established by American auto firms, including the Japanese transplants operating in the United States. The experience of Ford in Mexico is particularly apropos (see Box 1). The Ford motor plant in Chihuahua and its assembly operation in Hermosillo have been extensively examined and are considered examples of how an advanced production process can be successfully transferred to recently industrialized countries (Shaiken, 1990).

[1] This was a survey, in 1995, of managers of autoparts export companies located in the north of Mexico. (fig. Carrillo, Mortimore and Alonso,1997).

Box 1. - Ford

In 1938 Ford designed the internationalization strategy for constructing assembly plants for automobiles to be sold in Mexico. At the beginning of the sixties, Ford built the first industrial complex in Latin America, near Mexico City, and it integrated casting, machining, pressing and assembly. At the end of the sixties, the severe crisis of the AI in the United States was accompanied by profound changes in the sector. To avoid the loss of competitiveness vis-a-vis Japanese companies, Ford transformed its plants in the United States: it reduced the employment volume; closed, relocated or automated obsolete plants; modified labor relations; and reduced salaries and collective contracts. This process of growing rationalization was part of a global strategy known as "worldwide auto". The strategy implied establishing suppliers in different regions around the world in order to reduce costs and optimize earning rates. As a result, work-intensive auto part plants were built in the north of Mexico. To lower unit costs, Ford located plants to assemble seat covers (GM and Chrysler to assemble electrical harnesses). Using the same logic, Ford, GM and Chrysler built capital-intensive motor plants in Chihuahua and Ramos Arizpe, respectively for the former and the latter two.

Due to the limitations of the rationalization process in maintaining the sector market from Asian competitors, Ford designed a strategy that implied additional investment of Japanese and European firms. The idea was to adapt the flexible production model, which combines high technology and organization systems that reduce inventory, dead jobs and repetitive jobs and improves linking. With this strategy in mind, an assembly and stamping plant was constructed in Hermosillo, Sonora, to export Tracer and Escort models to the United States. The project involved a 500 million dollar investment by Ford and Mazda.

Ford-Hermosillo utilizes the latest in soft and hard technology and mainly Japanese components. It runs on the just-in-time system. To optimize this system, it has developed "satellite" suppliers. Additionally it maintains links with subcontractors of companies not affiliated with Ford, with companies that belong to Ford (radiators and seat covers) and with joint investments [inter IED (Direct Foreign Investment) relationships such as the harnesses, or with Mexican capital in windshield, window and aluminum cylinder plants].

The Hermosillo plant had an average of 0.276 defects per vehicle, much lower than the average for all Mexican assembly plants (0.665), and close to the maximum level worldwide (Olea, 1993). This operation is rated among the five best plants in all of North America.

The incorporation of both hard machinery and equipment and soft new forms of job and production organization technology was aimed at standardizing the production norms of Mexican plants with international production conditions. Despite this trend, differentiated technological and organizational strategies have existed as a function of a large number of variables. Several studies mention the following aspects: the firm, establishment size, plant, product, geographical location, market orientation, strategic position of the company and type of union or absence thereof (Arteaga, 1992, Micheli, 1994; Carrillo, 1993, among many others). In other words, adaptation of the Japanese production system, in Asian transplants as well as American, Mexican and German automotive corporations, is carried out in a myriad of manners, depending on localization conditions (institutional contexts and job markets) and specific strategies on both the corporate and individual establishment levels, a phenomenon known as hybridization (Abo, 1994).

Particularly in job organization at assembly plants, greater homogeneity has been noted, especially since the mid-eighties, as far as the trend towards making the job process flexible: ample mobility of shifts and positions, reduction of qualification categories and polyvalence development, ways of involving workers, work teams, total quality and statistical process control programs. (Micheli, 1994; Covarrubias and Grijalba, 1994; Shaiken, 1990). Making the labor process more flexible has been accompanied by expanded worker training and an organizational simplification process – or greater flexibility in internal markets – through decreasing the number of positions, qualification categories and salary levels, together with externalizing numerous services, such as cafeteria, drivers, cleaning, etcetera, through subcontracting (Carrillo and Ramirez, 1997:21-23).

Finally, it should be mentioned that while the plants set up as of a decade ago incorporated flexible forms of job organization from the outset, for the older plants, with deep-rooted labor

practices and stronger union presence, the transition to new organizational forms has meant higher levels of conflict and resistance (Bayón & Bensusán, et al., 1997). Nevertheless, Covarrubias and Grijalba (1994) mention that a young, non-unionized labor force did not necessarily mean greater willingness and ability to adapt to new forms of job organization in the companies in the north nor that nonconformity was necessarily more pronounced in the old plants.

Industrial Clusters

During the import substitution phase, the domestic auto parts industry was developed to supply the OEM industry. Its evolution was subject to governmental obligations and its competitiveness conditioned by the existence of markets protected by decree. Then, during the export substitution period, major adjustments were made in Mexico at the macro and meso levels geared to strengthening and deregulating direct foreign investment, especially that which has performed excellently, as in the case of the automotive and *maquiladora* industries. The decade of the eighties and the beginning of the nineties were characterized by a clear policy of commercial liberalization, foreign investment promotion and sectorial deregulation.

This permitted the establishment of new plants destined for export and the restructuring of already existing ones. Their relationship with domestic auto parts was substantially modified, as the degrees of domestic integration either diminished or, in some cases, disappeared. Companies not only opted to contract with internationally highly competitive suppliers, but the very tariffs in the United States (as the HTS 9802) discouraged the development of suppliers in Mexico, through tax penalties on the greater added value generated beyond U.S. borders.

In the present decade, there was a substantive change in the macro level in Mexico. On the one hand, NAFTA is signed, establishing a gradual and differentiated reduction of tariffs for the OEM industry and auto parts, as well as the rule of origin which begins with an obligatory 50% of regional net content, going up to 62.5% as of the ninth year. This allows for greater vertical integration of the OEM plants and the participation of foreign capital in the auto parts sector. And on the other hand, significant governmental efforts are made to develop suppliers. So far the second half of the nineties has meant the start of a more active policy to promote production linking. Of particular relevance was the establishment in May of 1996, of the Industrial Policy and Foreign Trade Program, which proposes as one of its strategic lines: inducing the development of highly competitive industrial, regional and sectorial groupings with a high level of participation by micro, small and mid-size companies.

To encourage *clusters*, various strategies for change are being supported, such as the development of new local suppliers for the *maquiladora* plants (for example, plastics, tools and blocks) and a new type of infrastructure (as for example ISO-9000 certification programs, worker training centers, managerial technical schools, etc.). Another example is the development of components of mid and low-level technology and basic processes in the automotive industry (Bancomext, 1997).

The strengthening of development policies for production chains combined with macro adjustments have provided the necessary conditions in this country for the development of a different type of linking with the traditional international/vertical subcontracting, removed from local economies, as in the case of many *maquiladora* auto parts plants. Both foreign and domestic companies are expanding their regional content through production integration within the company itself, or through the development of suppliers in Mexico.

The development of customer-supplier relations systems, territorially integrated in Just in Time (JIT) complexes and unified under international quality standards like ISO-9000, have allowed for the forming of complex semi-clusters (Ramirez, 1997), as in the case of Ford-Hermosillo, GM-Ramos Arizpe and VW in Puebla. Parallel to this new situation, greater intra-firm relations in *maquiladora* companies also take place. For example, in the NAFTA countries Chrysler is developing first-line suppliers with long-term contracts and second-line suppliers, at the same time as it is handling second and third-line suppliers together. All of this is being done through the extended supplier company with TQM (total quality management) practices and QS-9000 norms, world class research and development, and both strategic and measurement programs for

maximum development of suppliers, among others. In the case of General Motors, it is aiming to have all of its suppliers certified under the QS-9000 norm in 1998 and that in the near future, its first-line suppliers have 0 PPM (no defect per million parts), control and give the appropriate requisitions

Box 2. - Company A

From the beginning of the 80's, GM decided to establish *maquiladora* plants for harnesses and electrical parts in Juarez and later in Matamoros. By 1988, the Delphi-Packard division of the firm had more than 10 *maquiladora* plants specializing in electric cables. Other divisions, such as Delphi-Electronic Systems (Delphi-E) entered Juarez with products for electrical-electronic use.

We will examine the case of an *maquiladora* plant from the Delphi-E division (which we will name Company A). This company was founded in 1980 to produce electrical circuits, sensors and switches. By 1993, sales by this plant reached 385 million dollars, aiming 87% of production to the North American market (including Canada) and the rest to Mexico and other countries. In 1995 it produced 20 million electrical circuits and 17 million sensors. This plant has improved its competitiveness so far during the nineties, because it has been able to respond efficiently to product and technology changes with high quality products. It has already been granted QS 9000 certification and has received other awards, such as the Q1 from Ford. Of its nearly 100 customers, the main ones are 2 Ford and 2 GM plants in the United States. The main pressure the plant has had to deal with so as to improve competitiveness has been to reduce product and delivery cycle times, to which its principal response has been to specialize more, and secondly, to adopt new organizational practices. Personnel training at different levels is also outstanding. Its average duration was 70 hours (the average of the manufacturing industry nationwide was 40 hours in 1992).

In 1996, the plant employed 4,200 people, of whom 85% were production workers and 7% engineers and production technicians. This occupational structure, which clearly reflects the characteristic of being an unskilled labor intensive company, differs however, from first generation plants. In the first place, salaries and benefits in this plant represented less than 15% of production value. Second of all, the plant is 70% automated in terms of production value. And thirdly, it has adapted the Japanese production system. It was the first plant to begin to use more people, to introduce new synchronized manufacturing ideas (JIT, administration by cells, companies within the company) and to diversify its products. It currently handles 18 inventory rotations weekly. This helps to understand why the most profound changes that have affected the plant, since the beginning of NAFTA, have been precisely the development and design of both the product and the process (that is, the changes in product technology and in setting up the work in production cells) and why the main human resources-related problem in the company is the lack of specialized personnel and its stability (high levels of absenteeism and personnel rotation exist).

In terms of production links that Company A has made in Juarez, they come down to 2 cardboard companies (of the 273 suppliers it deals with), in addition to a small machining workshop (Company C) that employs 8 people, of whom 5 are technicians, and has annual sales of 40 thousand dollars. The lack of domestic integration of Company A is due to low reliability in terms of scheduled delivery and simply to the fact that the suppliers they need are not available in the area. However, the company has strategic alliances planned with both domestic (Condumex) and foreign companies in order to develop suppliers, and their main competitors are precisely in Ciudad Juarez. Likewise, thanks to its scale volume, the degree of specialization attained and the competitiveness achieved by this company, the Delphi-Electronics division considered relocating a highly qualified segment (within its product chain) near Company A.

to the second-line suppliers, develop abilities and technical and technological leadership, commitment to research and manufacturing development and expertise, among others (Ministerium fur Wirtschaft und Mittelstand, 1996).

Since the beginning of the eighties, the technological and competitive level attained by the OEM and export motor companies established in Mexico, as well as their industrial organization in JIT complexes, was exemplary (Shaiken, 1990; Ramirez, 1997).

Another excellent case has arisen more recently: the industrial evolution of *maquiladora* auto parts plants. It is worth emphasizing this phenomenon since it shows that even in highly manual labor intensive segments characterized by traditional production detachment, local production link-ups are formed. This is a substantial change and has important industrial implications, because it is one

of the major segments in Mexico and probably the automotive segment that will soon have the most employees.

One paradigmatic case is the development of linking based on qualified work in General Motors Delphi division *maquiladora* plants. Boxes 2 and 3 summarize the general characteristics of two GM-owned, productively-linked companies in Ciudad Juarez. Assembly companies attain international competitiveness through technological modernization and the rational utilization of intensive labor, which allowed for the arrival of a research and intensive knowledge development center with over 2,000 engineers and technicians, located just minutes away from its customer, the *maquiladora* plant.

Each offered a full package service that goes from the idea, through prototype design and feasible product manufacturing, to massive production (Carrillo and Hualde, 1997).

Box 3. - Company B

The center of auto parts engineering, Company B, located in Juarez, is part of the firm Delphi Automotive Systems (Delphi-A), which, in turn, is one of six General Motors divisions. After four years of restructuring, Delphi-A is now a very profitable firm. Under this strategy, the Delphi-E main office decides to relocate one of its seven research and development centers outside of the United States for the first time in its history. The Anderson, Indiana plant is to be moved to Ciudad Juarez. This strategic decision arises from the need to reduce production cycles, delivery times and overall costs.

Company B opens its doors in this city on July 2, 1995, as one more *maquiladora* plant. But in this case, it is the first research, design and development (R&D&D) center of its kind, not just in the *maquiladora* city, par excellence, but in all of Mexico. With an initial investment of 150 million dollars (a little less than half in equipment), Company B produces electrical circuits and sensors.

The decision to relocate the R&D&D center to Ciudad Juarez was strategic for GM. According to the managers interviewed, the three main factors behind location were: (a) the proximity to the United States; (b) the 15 years of learning experience of the *maquiladora* producing firms in Juarez (for years recognized as a world renown zone and product), and (c) the quality of the competency of the Mexican engineers.

Engineers and technicians require certain knowledge (such as Autocad 12 if they are directly in charge of design) to be able to manipulate the GM Unigraphics system. “It is a very new job for everyone…the work, machinery, equipment…,” where the central competencies are mechanical, electromechanical and magnetic, and of course creativity. That is why some Mexican engineers and technicians were sent to the center in Anderson for 8 months. The center offered its engineers and technicians, in 1995, three months training in different places, 80 hours to its production workers and 40 hours to managers and administrators. Specifically, they were all involved in the QS-9000 norm (have now been certified) which, as one manager commented, “was very difficult to obtain, since normalizing procedures in a research center are a very complex task, given that the processes are not standardized.”

Regarding salaries, the center works with 4 bands and many ranges within each band. While salaries are relatively high within the local context, 900 dollars for recently-hired engineers, they are only a little above other *maquiladora* plants and even the same as those of their main link (*maquiladora* Company A)…

With regards to production linkages, Company B, like the vast majority of *maquiladora* plants in Mexico, has a low level of domestic integration (1%). Most suppliers are in the United States, although they have a globalized supplier system with 30 countries participating. Their main suppliers in Mexico are located outside of Ciudad Juarez (Toluca, Chihuahua and Puebla). Its only local suppliers are an *maquiladora* plant that furnishes magnet and a few machining workshops. They are negotiating with Condumex in another location, to develop two magnet-wire suppliers.

Despite this poor 1% domestic integration, this center is not the *technological island* mentioned previously. Company B is locally integrated into an intra-firm system. Project development even encompasses manufacturing, which is performed by Company A and other plants that the division has in Ciudad Juarez and Chihuahua. These two *maquiladora* plants (Company A and B), and probably others established in Chihuahua, act as a sole industrial complex, dealing with the same customers, although their activities, production conditions and occupational structures are very different.

EMPLOYMENT AND SALARIES

Employment and Work

The IAM has been characterized by employing a significant amount of people and generating many other indirect jobs. As for its evolution, it should be noted that it increased at the same time as marked geographical employment redistribution took place, in the eighties and more so during the second half of this decade. In 1977, only the OEM industry went from 34 thousand jobs to more than 60 thousand in 1981, plus 40 thousand others in auto parts (de Maria y Campos, 1992). By 1989, the IAM employed 121,100 people (Cimex-Wefa, 1989). Nonetheless, as of 1992 the rate of job generation slowed, making it possible to note the restructuring of the sector aimed at raising competitiveness within the context of opportunities offered by NAFTA. The greatest loss of jobs came with the 1994 crisis (Bayón & Bensusán, et al., 1997). While during the 1990-94 period production increased 37%, employment went down 17%, and between 1990 and 1995 production rose 13% and employment decreased 28%. Therefore, during the NAFTA period the IAM presents a crucial paradox: on the one hand an increase in production, exports and efficiency, though on the other a drop in employment volume is observed, especially for salaries and benefits.It should be noted, however, that as of the eighties, a growing source of employment emerges in the automotive sector as well as in others such as electronics: the export *maquiladora* industry. In 1980 there were 53 *maquiladora* plants which employed 7,500 people, and from that year to 1995, the industry has grown 18 times in terms of employment. It is expected that between 1995 and the year 2001, the personnel employed will double. By 1997, there were 202 establishments in Mexico employing 186,430 people (SECOFI, 1997).

Table 6 clearly summarizes the participation of the larger segments that make up the IAM. It can be seen that in 1982 the main employment-generating segment was auto parts with 119.8 thousand jobs or 46.1%, followed by the distributors with 77.1 thousand jobs or 29.7%, and the OEM industry with 49.9 thousand employees or 19.2%. Export *maquiladora* plants only comprised 5% of the 259.0 thousand employees that year in the overall automotive sector (SECOFI, 1997). From that year until today, two rather homogeneous trends in employment behavior may be seen: first, all the segments, except distributors, have generated more jobs in the 1982-97 period. In 1997, the OEM industry had 17 thousand more jobs than in 1982, the auto parts industry 30.8 thousand, and *maquiladora* plants 156.2 thousand. Secondly, except for *maquiladora* plants, they all lose relative importance: the OEM industry dropped 4.5 percentage points during that period; distributors decreased 14.7 points and auto parts 13 points; while in contrast, *maquiladora* plants gained 32.2 percentage points.

According to de Maria y Campos, the causes of automotive employment are fairly obvious: the drop in workers' real salary. But it is added that other additional costs are also much less expensive than in other countries: transportation, electricity, fuel and components. In 1988, Booz, Allen & Hamilton (1990) compared the costs of motor production in Mexico with countries like Brazil, Germany South Korea, etc., and it was shown that labor costs in Mexico were between 5% and 10% of those in the United States. That same year another study concluded that the Mexican combination of high quality and low labor costs is unbeatable in the world (Krafcik, 1988). This author mentioned that high productivity (31 hours to produce a vehicle in Ford-Hermosillo vs. 48 hours in Brazil and 33.5 in Southeast Asia) and the excellent quality of its production (105 defects for every 100 cars in German companies exporting to the US vs. 64 in Mexico) were the great advantage that this country offered, in addition to its unsurpassable geographic location for exporting to the United States (cited in de Maria y Campos, 1992). In regional terms, employment tended, since the beginning of the eighties, to be concentrated in the new plants in the north – basically in the *maquiladora* plants. On the contrary, the OEM plants in the center of the country, such as DINA, Ford-Cuautitlan, Volkswagen and Nissan-Cuernavaca, underwent severe personnel adjustments – due to layoffs or shut downs –, that mostly affected the unionized workers with highest seniority and union experience, as well as workers who participated in the resistance movements that took place between 1980 and 1992. The most drastic adjustment occurred in Dina, where personnel was cut nearly 90% as of 1982, going

from almost 12,800 workers to the 1,348 employed today; Volkswagen went from 15,409 workers in 1981 to 9,000 in 1996; Nissan-Cuernavaca had 4,800 workers in 1987 compared with its current 1,755; in 1986, 5,115 workers had jobs at Ford-Cuautitlan, whereas 3,222 do today. (Bayon, 1997)

Not just employment fluctuations have been significant, however. The type of job and the people who took over the new positions have changed significantly since the end of the import substitution period. Five aspects should be emphasized:

- The new positions were occupied by a new labor force, characterized by a very different socio-economic profile from the traditional one. We are dealing with employment of young males with 12 years average schooling and little or no previous union experience for OEM plants. In the case of *maquiladora* auto parts plants, there are also young women and men with low educational levels (6 years), who have industrial work experience (at *maquiladora* plants) and no union experience.
- The requirements for skilled manual labor in OEM and motor plants changed. Defining skill as human capital, it is greater in the modern plants than in the older ones. Also, in the case of *maquiladora* plants work skill has risen. According to interviews with companies (see footnote 7), 36% of production workers were considered skilled by their managers.1 Moreover, an average 4% of the staff of each company was made up of technicians and engineers and 6% supervisors.
- The number of technicians has gradually grown. The proportion of number of workers to technicians went down from 9.38 in 1980 to 8.29 in 1995 for the *maquiladora* auto parts plants nationwide.
- There is a high degree of exchange on the local level, among technical and advanced educational centers and the *maquiladora* auto parts plants. A study showed that in 1990, 20% of the employed population that worked in the *maquiladora* plants were trained as technicians or professionals in the local mid or advanced-level educational centers (Carrillo, 1993;252).
- Job training has grown significantly in importance in all the companies. Several studies on the sector show that training is associated with productivity and company size. In general, training needs have risen in all of the establishments; but the increase has been greater within export companies, followed by those that maintain dual – domestic and export – markets. The intensity of the training varies depending on the origin of capital and the product chain, with the foreign companies focusing more on training. They assign a higher budget and take advantage of their connections with other companies within the same firm. Several companies have implemented individual training programs with the aim of covering cells of knowledge and skills, and they have established evaluation and ranking norms for acquired qualifications, among other aspects. Teamwork in many of them is the foundation upon which the continuing education model is built, whereas external training is basically geared to higher occupational categories.

In conclusion, it can be said that both the OEM and auto parts industries, whether they are large, mid-size or small, display substantive job and employment changes. Job content is enriched and employment expanded, especially in new plants. In the vast majority of cases, the establishments share one central feature: they are manual labor intensive.

Unions

The IAM has traditionally been one of the sectors with the highest unionization rates within the manufacturing industry in this country. During the import substitution period, all of the OEM plants had a union and a great deal of auto parts companies were also unionized. In the seventies and beginning of the eighties some collective contracts of automotive companies, like Ford, included the best work and salary conditions in the entire manufacturing industry in Mexico. But this situation changed radically with the opening of new plants and restructuring of older ones. Along with these phenomena, or rather as a precursor to them, union capacity diminished through decentralization of collective contracts, the disappearance of some of them and the entrance of new companies into low unionization zones (Chihuahua and Sonora, for example) with protective (and corporative) unions.

As Bayón & Bensusán, et al. (1997) notes, this industry has historically been characterized by a strong union presence and combativeness where:

The unions of automotive assemblers had gained quite a leading role in the struggles for union democratization and autonomy during the seventies. At that time they had considerable resources of power inside the plants, derived from the arrangement of bilateral elements in the control of work processes and internal markets…(however)…The balance of power was notably modified starting in the eighties…, a situation that allowed the companies to unilaterally impose sector modernization within the framework of the neoliberal line of the policies of the Mexican government that accompanied trade liberalization and regional integration. Not only automotive production restructuring began early on, but also union defeat. (Bayón & Bensusán, et al., 1997).

This process occurred – the author mentions – with the complicity of official leadership or after defeating the few who attempted to offer some resistance to company aspiration of obtaining a wide margin of freedom to implement the methods, rhythm and range of technological and organizational adjustment. The CTM (Mexican Workers' Confederation) participated actively in this process and has now become the main headquarters inside the transnational firms. The new collective contracts set the minimum conditions established in the Federal Work Law, even before the plants began operating (Bayón & Bensusán, et al., 1997). Several reasons explain this change in union headquarters: (1) the automotive industry does not have an organizational structure at the sectorial level capable of involving the different members of the production chain; (2) salary negotiation is nationally centralized, and a high echelon political arrangement among the official union headquarters, businessmen and government, predominates, along with a decentralized collective contract structure at the plant level; (3) the extension of the flexible contractual model of the northern plants to the industry as a whole and (4) the characteristics of union leadership that combines everything from the crippling pragmatism at the top of the CTM to the inexperience and extreme weakness of the leaders in the new plants. (Bayón & Bensusán, et al., 1997). In 1980, a union dispersion process began, and unions were set up for each exporting plant. These newly-formed unions were independent of the pre-existing ones in the older factories and signed separate collective contracts, so that the number of collective contracts and unions in the industry multiplied. GM ended up with three different unions; Chrysler with two; Nissan with three; Renault had four unions before it closed down; and although it has only one union, Ford has three collective contracts, each with a different review date. The employment situation is not the same in all of the plants within each company. The collective contracts in the new factories implied a change in labor policies with a much more limited scope for the union in terms of production process organization. The unions in the pre-existing plants were opposed to such a limited function. In this way, the unions in the new plants lose several hiring, firing and worker transfer privileges. This increases the number of temporary workers, personnel rotation between departments, positions and shifts, longer working hours, etcetera.

After the restructuring process of the eighties, productivity agreements were made among unions, companies and the government, within the framework of the National Agreement for Increasing Quality and Productivity in 1992. These agreements have now been signed in several automotive plants, and the main objective is for the indirect salaries to go up as a function of the increase in productivity and quality, through productivity bonuses. The experience in Mexico shows that companies award such bonuses in differentiated ways, depending on the size, product market and position along the production chain.

While in small companies productivity bonuses are usually based on attendance and punctuality and are generally limited to 2% of the direct salary monthly, in more active companies, as in the case of assembly plants and their main auto parts suppliers, production of pieces above established standards, error detection, waste and dead time reduction, order and cleanliness, etc. are additional criteria. Therefore, bonuses ascend to 4 or 5% a month, which shows that even in these companies, the relationship between salary and productivity is still quite limited (Bayón & Bensusán, et al., 1997).

Furthermore, productivity bonuses, even in exporting and organizationally modern companies, do not seem to influence work performance. Thus we have, on the one hand, that on the average these bonuses represent a low salary percentage; and on

the other, that payment of them is not a completely common practice. In the auto parts *maquiladora* industry, for instance, bonuses are paid for attendance and punctuality. Even in companies like Ford Hermosillo, that have salary and promotion review structures and new, multi-skill work systems, at least until 1993, payment was individual and regulated by seniority in the plant (Carrillo, 1993).

Salaries and Benefits

Contrary to production and productivity evolution, salaries have exhibited a downward trend since the eighties. If we take salaries in 1980 as base 100, it turns out that they decreased between 1979 and 1988 from 215.3 to 107.7 (Cimex-Wefa, 1989). Similar observations are made for the years prior to and following NAFTA. Obviously, this process is related to the devaluation of the Mexican peso against the dollar, but also to the depreciation of the labor force.

The salary trend, like flexibility in internal job markets, is oriented toward growing homogenization among assembly and auto parts companies, but downward homologation is looking ever more like the labor situation in *maquiladora* companies. Let us look at a clear example. A transnational industrial complex in the State of Mexico that produced cars for the domestic market paid an average of 300% more to its production workers at the beginning of the eighties than the *maquiladora* auto parts company of the same corporation located in a border municipality, and 200% more than an export assembly plant, also part of the same corporation, located in a northern state. By 1990, these differences had lessened as it only paid 100% more than the *maquiladora* plant and 50% more than the assembly plant. In 1996, the two assembly plants paid practically the same amount, and the salary level was just 50% higher than that of the *maquiladora* plant.

With the 1994 crisis and subsequent job loss, another salary drop was produced, of nearly 30% between December 1994 and 1996. In other words, the nineties have not managed to reverse the negative impacts on labor of the restructuring process and regional production integration. While corporate headquarters strategies and those of the plant managers themselves have brought this process on, the Mexican government has played an even more important role:

As has been occurring for almost two decades, the increases in production , productivity and sales levels in the companies continue not to be reflected in improvements of the deteriorated standard of living of workers, since salary hikes continue to be decided at the top on a national level without taking into account such indicators, with the complicity of an archaic and worn out union structure, basically concerned with maintaining its old time privileges. (Bayón & Bensusán., et al., 1997).

Table 5 makes it possible to compare the evolution of compensation, productivity, employment and production in the automotive industry between 1994 and 1997. It is interesting, first of all, to see that, relatively speaking, each salary is only a little higher in the IAM than in the manufacturing industry in Mexico. (-20% and -18%, respectively); while job loss is somewhat more pronounced (-4% as opposed to -1%). In the second place, in all areas of activity, real salaries went down, though not employment. At least in three areas (motors, suspensions and brakes), the number of employees grew in the period under consideration, and in one area (transmissions), it remained stable. Thirdly, except for bodies and trailers, all branches raised productivity. Fourth and finally, just as there is no positive association between productivity and salaries, there is no correlation, either, between greater productivity and lower compensation.

The areas that had a moderate decline in compensation (motors, transmissions, suspensions and other parts and accessories) display productivity changes of distinct magnitude (moderate in motors, mid-level for transmissions and suspensions, and high for other parts and accessories). The same thing happened with the branches that experienced a more drastic drop in salaries and benefits (OEM, bodies and brakes) since they have different productivity speeds (moderate for brakes, very high in OEM plants and even negative for bodies). Therefore, viewing this information for the first time, neither productivity growth is associated with salary growth, nor productivity levels are related to compensation declines. This may have several explanations or, rather, questions to be posed. An initial hypothesis could be that productivity is based mainly on labor intensification and depreciation of manual labor and offset by the export level attained. A second

hypothesis would be that the distortion caused by the economic crises in Mexico at the macro level (read devaluation) do not allow productivity evolution to be joined, or in other words, that productivity is strongly based on the low track (devaluation's) and not on the best use of human resources. A third hypothesis could be that, in spite of dealing with a seemingly integrated sector that is apparently similar in its distinct branches, we are faced with the presence of production segments with a degree of autonomy as a function of the market toward which they are oriented, the level they occupy within the product chain and the technological and specialization level they have been able to attain. All of this affects a variety of productivity performances and salaries. In short, these and other questions cause us to emphasize that beyond the behavior of the economic and labor variables analyzed in this section, it is necessary to learn more about the sources of company competitiveness in order to be able to explain more solidly these divergent processes among productivity, employment and compensation.

OVERALL EVALUATION

The economic importance of the Mexican automotive industry in this country is clear; it represents 12% of the industrial GNP (and it grew relatively 5 times more than the national GNP), and in 1994 it generated 35% of manufacturing exports and 18% of total exports (Mexico Automotriz, 1995; INEGI, 1996). The IAM is the number one import and export sector in the country (Bancomext, 1997). In 1996 it was in twelfth place of the main automobile producers in the world, and by the year 2000 it is expected to be among the top ten (Bancomext, 1997).

The evaluation of the overall sector clearly shows positive development in terms of economic performance. Production as well as exports, employment and productivity have grown considerably. Along with this, a process of specialization and production complexity, territorial specialization, the formation of competitive industrial groupings (or industrial clusters) and enhancement of job content are observed. Job competitions, or tacit manual labor qualifications have been enriched thanks to greater and better training offered by the companies, evaluation systems based on individual and group performance and work systems grounded on greater technical control of process quality. All told, we are looking at a clear process of industrial upgrading, which is as yet incomplete due to the lack of first, and especially, second and third-line suppliers and truncated in the realm of labor because of low relative salaries and the weak negotiating capacity of both union and non-union workers.

This trend and general evaluation may bring out significant differences when observing the behavior of the main branches of the automotive sector. Some areas maintain production, employment and productivity growth together with diminishing compensations. Others sustain an upward production and productivity tendency, while decreasing staff and compensation levels. There are even others with a negative trend with respect to all the indicators. In other words, there are at least three groups within the automotive industry: the first group in severe crisis; the second raising competitiveness but based in part on work intensification and a reduction in real salaries; and the third group that has managed to increase production, efficiency and employment, though not compensation. The first group, therefore, composed of body and trailer manufacturing, is undergoing a severe structural crisis. The second, made up of manufacturers of automobiles, transmissions and other parts and accessories, considerably heightens its competitiveness but at the cost of a moderate process of work intensification and cheapening of manual labor. And the third group of manufacturers of motors and their parts and suspension and brake systems have been able to steadily raise competitiveness as well as employment.

In accordance with the intensity of the change, the manufacture of both automobiles and other parts and accessories stand out because of the degree of competitiveness and efficiency achieved in the 1994-1997 period. In contrast, body and trailer manufacturing are noted for the drastic drop in real salaries. Greater efficiency in companies is sought after and tested internally in very different ways in the distinct segments that compose the automotive sector. This is reflected not only when observing the behavior of the branches, but upon reviewing the cases of companies, firms and plants analyzed in the extensive literature available. For example, some companies have preferred the

technological path by purchasing improved technology in modern equipment. Others have favored more worker training, while others have opted for increasing productivity through incentives, and still others have focused their attention on adapting – by very varied means – the Japanese production system. No matter what, the vast majority of companies have had, although at very different levels, to modernize forms of production and work organization, normalize their quality processes -preferably with certification required by the assembly plants –, offer more job training and redirect part of their production toward exportation. Many economic obstacles to increasing efficiency still exist, as is the case with the price of imported components, the high cost and low quality of domestic input products and the recurrent overvaluation of Mexican currency. However, there are also numerous obstacles to achieving more stable development in the automotive sector, in particular the low compensation paid to workers and the corporate unions, both traditional as well as transparent (this is the one that no one sees but does exist).

Table 1. – Mexico : Vehicle Production and Market (In Units) 1985-1995

	1985	%	1990	%	1995	%	1997 (Jan-Nov)	%
Total	398,052	100	830,179	100	938,817	100	1'235,953	100
Domestic	339,629	85.32	551,621	66.44	160,139	17.05	317,232	25.67
Export	58,423	14.68	278,558	33.56	778,678	82.95	918,721	74.33

Note : Vehicle production includes automobiles, trucks, tractor-trucks and buses.
Source : *INEGI, La Industria Automotriz en México, México, 1991 and 1996. AMIA, Bulletin 384, Mexico, November 1997.*

Table 2. - Mexico: Total Productivity Index for the Manufacturing Industry and the Automotive Industry, 1988-1994 (1993=100)

Period	Total	Manufacturing Industry	Automotive Industry
1988	94.7	88.5	91.6
1989	95.7	91.4	88.8
1990	96.1	94.4	91.6
1991	97.3	96.7	106.5
1992	99.2	98.6	99
1993	100	100	100
1994	101.8	106.3	107.4

Note : The index was calculated according to the following formula: { (PIBK / PO) i / (PIBK/ PO) b}* 100 . Where PIBK is the Gross Domestic Product at constant prices; PO is the Personnel Employed; i is the year analyzed, and b is the base year, in this case 1993.
Source : *INEGI, La Industria Automotriz en México, México, 1996*

Table 3. – Mexico : Automotive Industry Productivity Index by Activity, 1988-1994 (1993=100)

Period	Total	Automobiles	Motors and Auto parts	Rubber Products
1988	91.6	59.9	122.5	95.7
1989	88.8	65	111.8	94.2
1990	91.6	68.6	110	95.2
1991	106.5	83	120.9	98.9
1992	99	95	102.9	103.7
1993	100	100	100	100
1994	107.4	111.4	109.9	106.5

Note : The index was calculated according to the following formula: { (PIBK / PO) i / (PIBK/ PO) b}* 100 . Where PIBK is the Gross Domestic Product at constant prices; PO is the Personnel Employed; i is the year analyzed, and b is the base year, in this case 1993.
Source : *INEGI, La Industria Automotriz en México, México, 1996*

Table 5. - Mexico: Evolution of the Main Automotive Industry Indicators, 1994-1997 (Percentages)

	Production Value	Compensations	Personnel Employed	Productivity
Manufacturing Industry	+27*	-18	-1	+28
Metal Manufacturing Industry	+54	-15	+2	+52
Automotive Industry (3841)	+56	-20	-4	+62
Automobile and truck Manufacturing and Assembly (384110)	+70	-25	-12	+93
Manufacturing and Assembly of automobile and truck bodies and trailers (384121)	-36	-53	-22	-18
Manufacture of motors and their parts for automobiles and their trucks (384122)	+18	-6	+9	+9
Manufacture of parts for the transmission system of automobiles and trucks (384123)	+22	-11	0	+22
Manufacture of parts for the suspension system of automobiles and trucks (384124)	+28	-7	+7	+20
Manufacture of parts and accessories for the brake system of automobiles and trucks (384125)	+36	-25	+17	+16
Manufacture of other parts for and accessories for automobiles and trucks (384126)	+75	-14	-1	+76

Note : * Percentage of change between January 1994 and May 1997. January 1994=100
Source : *INEGI, Monthly Industrial Survey, Mexico (INEGI Information System on CD) (Calculations made by the author).*

Table 6. - Employment Distribution in the Automotive Sector, 1982-1997 (Thousands of Employees).

Year	Oem Industry (Terminal)	%	Parts Industry	%	Distributors**	%	Maquiladoras	%	Total
1982	49,900	19.2	119,800	46.1	77,100	29.7	13,000	5.0	259,000
1983	46,800	21.9	102,500	47.9	44,600	20.9	20,000	9.4	213,900
1984	54,900	20.7	114,700	43.2	63,000	23.7	33,000	12.4	265,600
1985	53,600	18.5	128,700	44.3	65,100	22.4	43,000	14.8	290,400
1986	49,800	18.9	116,800	44.4	43,100	16.4	53,000	20.2	262,800
1987	50,900	17.7	121,900	42.4	51,900	18.0	63,000	21.9	287,700
1988	51,900	15.5	141,100	42.0	59,800	17.8	83,000	24.7	335,800
1989	52,400	13.5	155,200	40.1	89,300	23.1	90,000	23.3	386,900
1990	52,700	13.7	173,600	45.2	69,000	18.0	89,100	23.2	384,400
1991	68,800	15.5	184,200	41.6	78,000	17.6	112,000	25.3	443,000
1992	72,000	15.0	201,500	42.1	81,000	16.9	124,400	26.0	478,900
1993	66,200	14.8	175,100	39.2	79,000	17.7	126,600	28.3	446,900
1994	65,700	14.7	171,800	38.4	80,000	17.9	129,400	29.0	446,900
1995	53,600	13.7	145,400	37.3	52,000	13.3	139,100	35.7	390,100
1996	57,200	13.6	150,600	35.7	57,000	13.5	157,300	37.3	422,100
1997 p/	66,900	14.7	150,600	33.1	68,000	15.0	169,200	37.2	454,700

P: Projections made by the different sectors of the automotive industry. In the case of INA, no information was presented, so that of 1996 was considered.

Sources : *SECOFI, Office of the General Director of Industries, Office of the Director of the Automotive Industry with information provided by the companies in the questionnaire as a procedure for registry as a manufacturing company; the Industria National de Auto parts, A.C. (National Auto parts Industry), and the Office of the General Director of the Mid-size and Small Industry with data from INEGI.*

Jorge Carrillo
Colegio de la Frontera Norte
Universidad Autónoma Metropolitana-Iztapalapa
Chula Vista – États-Unis

BIBLIOGRAPHY

Abo, Tetsu. *Hybrid Factory*. New York: Oxford University Press, 1994.

América Economía. "Los 500 mayores exportadores de América Latina." Santiago, Chile, Septiembre 1996-97.

AMIA. "Asociación Mexicana de la Industria Automotriz." (varios n_meros) México, 1994.

Arjona, E. "La industria mexicana de autopartes durante el auge exportador de los años ochenta." (coord.) *La nueva era de la industria automotriz en México.* COLEF, 1990.

Arteaga, A. "La reestructuración de la industria automotriz en México y sus repercusiones en el viejo núcleo fabril" (coord.) *Proceso de trabajo y relaciones laborales en la industria automotriz en México*. FES, UAM-I, Mexico, 1992.

BANCOMEXT. Automotive Industry. Ponencia, "II Foro de Autopartes México -UE". México, 1997.

Bayón, M.C. *El sindicalismo automotriz mexicano frente a un nuevo escenario: una perspectiva desde los liderazgos*. FLACSO-México: Juan Pablos Editores, 1997.

Bayón & Bensusán, Graciela, *et al.* "Estrategias sindicales frente al TLC: México, Estados Unidos y Canadá" *El Sindicalismo del sector automotriz mexicano*. FLACSO, México (reporte de investigación), 1997.

Boz-Allen & Hamilton y Servicio de Información Tecnológica (INFOTEC). "Industria de autopartes." Estudio preparado para el gobierno mexicano. México, 1990.

Bueno, C., Aguikar, E., Márquez, L., Vázquez, R. "Relaciones estratégicas comprador-abastecedor en la industria automotriz: una comparación entre México y Japón" (coord.) *Japan INC en México. Las empresas y modelos laborales japoneses*. México: Porrúa, UAM-A, Universidad de Colima, 1996.

Carrillo, Jorge. "Maquilización de la Industria Automotriz en México. De la industria terminal a la industria de ensamble". *La Nueva Era de la Industria Automotriz en México: cambio tecnológico, organizacionales y en las estructuras de control*. Tijuana: El Colegio de la Frontera Norte, 1990.

_____"La Ford en México: Reestructuración industrial y cambio en las relaciones sociales." Tesis de Doctorado. El Colegio de México, 1993.

_____. "Maquiladoras automotrices en México: Clusters y competencias de alto nivel." (ed.) *Competitividad, Redes Productivas y Competencias Laborales*. Montevideo: OIT/CINTERFORD/Red Educación y Trabajo (1997): 193-234.

_____ y Hualde Alfredo. "Maquiladoras de tercera generación. El caso de Delphi-General Motors." *Comercio Exterior* vol. 47, no. 9, (septiembre 1997): 747-758.

_____, Mortimore, Michael y Alonso, Jorge. *Transnational Corporations and Industrial restructuring in Mexico. The Case of Auto parts and T.V. Industries*. Tijuana: El Colegio de la Frontera Norte, febrero, 1997.

_____ y Ramírez, Miguel Angel. "Reestructuración, eslabonamientos productivos y competencias laborales en la industria automotriz en México" *Competitividad, Redes Productivas y Competencias Laborales*. Montevideo: OIT/CINTERFORD/Red Educación y Trabajo (1997): 193-234.

Covarrubias, A., Grijalba, J. "El Caso de la planta Ford Hermosillo". Paper presented at Guadalajara Coloquium. Guadalajara: Guadalajara University, October 5-7, 1994.

CEPAL. "CAN: Análisis de la competitividad de los países." Versión 2.0. Santiago, 1997.

Cimex-Weffa. *Auto Industry Analysis* 2, no. 2. Bala Cynwyd. (junio 1989).

_____. *Maquiladora Industry Analysis* 10, no.1. Bala Cynwyd. (enero 1997).

De María y Campos, M. y G. López. "Reestructuración y desarrollo de la industria automotriz mexicana en los años ochenta: evolución y perspectivas." *Estudios e Informes de la CEPAL*, no. 83. Santiago, Chile, 1992.

Eden, L., Husband, K., Appel Molot, M. "Competing in a lean world: How the auto parts industries in Canada and Mexico are responding to the pressures of free trade and lean production." Texas A&M University, Williams College y Carleton University. 1996.

INEGI. *La Industria automotr_z en México* Aguascalientes, México, 1996.

Hernández Laos, E. y Aboites J. "La movilidad de la mano de obra en el sector manufacturero de México." *Cuadernos de Trabajo*, no. 4. Secretaría del Trabajo y Previsión Social. México, 1993.

Krafcik, John. "A First Look at Performance Levels at New Entrants Assembly Plants, International Motor Vehicle Program." Cambridge, mayo, 1988.

Mexican Investment Board (MIB). *Mexico and NAFTA: The North American Partnership. A guide to its essential elements*. México, enero, 1994.

México Automotriz, no. 471. México, octubre 1996.

_____, núm. 472. México, diciembre 1996.

Micheli, Jordy. *Nueva manufactura. Globalización y producción de automóviles en México*. México: Facultad de Economía, UNAM, 1994.

Ministerium fur Wirtschaft und Mittelstand. “Marktchancen und -strategien fur deutsche Automobilzulieferer in Nordamerika.” Nordrhein-Westfalen: VIA-NRW, 1996.

Moreno, Juan Carlos. "The automobile industry in Mexico in the eighties." *ILO Working Papers*, no. 22. Geneva, 1988.

Mortimore, Michael. "Transforming Sitting Ducks into Flying Geese: the example of the Mexican automobile industry." *Desarrollo Productivo*, n_m. 26. Santiago: ECLAC, 1995a.

_____. *Restructuring and International Competitiveness: The Mexican Automobile Industry*. Economic Commission for Latin America and The Caribbean (ECLAC), Internatioanl Development Research Centre (IDRC). Project: Productive Restructuring, Industrial Organization and International Competitiveness in Latin America and The Caribbean (CAN/93/541). Santiago, Chile, 1995.

_____. “Dimensiones of Latin American Integration: the NAFTA and MERCOSUR automobile industries.” Santiago: CEPAL, 1997.

Olea, M.A. "The Mexican Automobile Industry in NAFTA Negotiations." *Driving Continentally: National Policies and the North American Auto Industry*. Ottawa: Carleton University Press, 1993.

Ozawa, T. "The Southernly Spread of America's Automobile Industry.” “Flexible production and foreign direct investment as a corporate restructuring agent." *World Competition* 17, no. 4 (Junio 1994).

Pries, L. “Volkswagen: ¿un nudo gordiano no resuelto?” en *Revista Trabajo*, no. 9, México. 1993.

Ramírez, José Carlos. "Recent transformations in the Mexican Motor Industry." *IDS Bulletin* 24, no.2 (Abril 1993): 58-64.

_____. ”Los modelos de organización de las industrias de exportación en México.” *Comercio Exterior* 47, no. 1 (enero 1997).

Rosell, Jordi and Lourdes Viladomiu. *Cambio Estructural en México, La Industria ante el Tratado de Libre Comercio con EEUU y Canadá*. Barcelona, España: Informe del Departamento de Economía Aplicada, Universidad Autónoma de Barcelona, 1994.

SECOFI. *Estadísticas de la Industria Automotriz. Reporte Interno*. México: Dirección General de Fomento Industrial, Dirección de la Industria Automotriz y del Transporte, Marzo, 1995a.

_____. “Documentación interna.” México: Dirección General de la Industria Pequeña y Mediana, 1995b.

_____. *Evolución de la Industria Automotriz Mexicana*. México: Boletín Estadístico Trimestral, Secretaría de Comercio y Fomento Industrial. Subsecretaría de Industria, julio, 1996.

_____. "Documentación interna.” Mexico: Dirección General de Industrias.

_____. “La industria automotriz mexicana ante la globalización.” México: II Foro de Autopartes Mexico-UE, 1997b.

Shaiken, Harley. *Mexico in the Global Economy: high technology and work organization in export industries*. Monogragh Series, 33. San Diego: Center for US-Mexican Studies, University of California, San Diego, 1990.

_____ and S. Herzenberg. "Automation and Global production: automobile engine production in Mexico, the United states and Canada." *Centre for US-Mexican Studies Monograph Series*, no. 26, University of California, San Diego, 1987.

U.S. Congress, Office of Technology Assessment. *U.S.-Mexico Trade: Pulling Together or Pulling Apart?*. Washington, D.C.: U.S. Government Printing Office, ITE-545, Octubre, 1992.

Womack J., Jones D. and Roos D. *The Machine that Change the World*, New York: Rawson Associated Press, 1990.