

Working Paper No. 43

**INTERNATIONAL INTEGRATION AND LOCATIONAL CHANGE
IN MEXICO'S MOTOR INDUSTRY:
REGIONAL CONCENTRATION AND DECONCENTRATION**

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CONTENTS

	Page
I.Introduction: New Locational Patterns in Some Manufacturing Sectors	1
II.The Globalization of the Motor Industry	3
III.The International Integration of Mexico's Motor Industry	5
IV.Stages of Development of Mexico's Motor Industry	7
V.A Divided Industry	9
VI.International Integration and Specialization: The End of the National Car	15
VII.Spatial Impacts of the Process of International Integration	17
A.International Integration, Technological Innovation and Locational Change	17
B.Regional Concentration and Deconcentration	18
C.A New Territorial Division of Labour	23
VIII.Conclusions: A New Basis for a Policy of Decentralization and Regional Development	25
IX.References	27
Appendix 1	

I. Introduction: New Locational Patterns in Some Manufacturing Sectors

It is generally acknowledged that within Mexico there is a high degree of spatial concentration of industrial activity. This concentration has been strongly linked to the enormous regional disparities and the associated effects on the unequal distribution of income, employment, infrastructure and services amongst others (Lopez Malo, 1960; Lamartine Yates, 1965; Unikel, 1978; Garza, 1985). Already in the 1950's and 1960's the bulk of industrial output was known to be concentrated in Mexico's central region (The Federal District and the States of Mexico, Hidalgo, Morelos, Puebla, Queretato and Tlaxcala). In 1980 only two administrative regions (The Federal District and the State of Mexico) accounted for some 50% of the country's total manufacturing production.

The high level of industrial concentration in the central region, and in particular in the Metropolitan Area of Mexico City (MAMC), can be seen as the spatial outcome of a pattern of accumulation based on an import substitution strategy¹. This strategy was implemented principally in the period following the Second World War. There exists a close relationship between industrial growth (led by an import substitution model within a highly protected market) and its geographical concentration. This experience has been noted in several developing countries (Gilbert and Gugler, 1983; Kirkpatrick, Lee and Nixon, 1984; Gwynne, 1985). Market concentration, the existence of external economies, the level of industrial infrastructure and services, plus the proximity to the centres of political and administrative decision making have all been considered as the major factors for companies choosing to locate in Mexico's central region.

In the last few years, however, there has been an important degree of geographical dispersion in some manufacturing sectors. The automotive industry represents the best example of this trend. Traditionally all of the manufacturing facilities of this sector have been located in the southern-central region. Recently, however, the tendency has been to locate the new operations which have a strong export orientation in medium sized cities close to the southern border of the United States. This territorial redistribution of the Mexican automotive industry, the second in its history, is directly linked to the new and increasing process of international integration. This international integration within the automotive sector is a technical-manufacturing one and not only a trading or capital-investment integration. In this sense, the new pattern of location observed in Mexico must be understood within the context of change of the global motor industry.

As a result of the process described above, the Mexican automotive industry has entered a new phase of development. In contrast to previous patterns, this sector now forms an integral part of a global network of production. The expression of this process has caused changes in the composition of output and has given Mexico a more specialized role in the global motor industry. At the present time, from an analytical point of view, the automotive sector can be divided into two segments. One segment produces for the domestic market, is in recession and is primarily located in the south-centre of Mexico. The other segment produces for the external market, is booming and is located in the northern region.

It is important to point out the relevance of the process of international integration as one of the key elements in the present Mexican deconcentration/concentration of regional manufacturing. Perhaps because this process is a relatively new phenomenon it has not been considered, or researched, in the already scarce literature within the field of industrial location in Mexico. By-and-large, in explaining the relative redistribution of industrial capacity away from the traditional central manufacturing area,

¹Nevertheless, it was difficult for Mexico - with its enormous 3,200 kilometre border line - to follow a strict import-substitution policy, at least in the northern region.

existing studies have emphasized factors such as the existence of disadvantages in the MAMC, the relative improvement of infrastructure in peripheral regions and the effects of governmental programmes designed to assist the territorial deconcentration of industry (industrial estates, new towns, etc.). Furthermore, in many cases the spatial effects of sectorial policies are more important than those that result from deliberate regional development policies including physical planning and human settlements (Harris, 1983).

The Mexican economy is now going through an extraordinary process of transformation which is far from being concluded. This situation tends to reinforce the interconnections with the world economy and the present government policy has accelerated this process of change and international integration of the economy. As a result of the economic crisis which came to a head in 1982 the Mexican government was forced to adopt a new model of development. This new model rests on the production and export of manufacturing goods, linking the industrial base with the external trade. The impact on the territorial distribution of the economic activity resulting from this type of relationship requires new forms of planning of the spatial economy and also requires a restructuring of the present centralized system of the political and administrative functions.

II. The Globalization of the Motor Industry

The motor industry, which had already reached high levels of internationalization of capital in the post war period, has acquired a greater global nature in recent times (Jenkins, 1987; Dicken, 1986). The increasing international integration of production activities, which was particularly evident from the beginning of the seventies, has made the identification of "nationality" of motor-vehicles blurred. At the present time an automobile can be designed in Germany, assembled in Spain, use an engine sourced from Mexico and a transmission from Brazil, with a stereo systems from Taiwan and a starting motor from South Korea, amongst other internationally sourced components. The international integration in the motor industry is expressed in various different forms: technical-manufacturing, trading, capital-ownership, financing and distribution.

From the 1970's the automotive industry entered a new phase of intensive reorganization. This reorganization was driven by the economic recessions in the 1970's and the early 1980's and the intensified international competition due to the entrance of new world class producers (such as Japan and more recently South Korea). This process forced the automotive companies to carry out radical changes in their strategies of global marketing and manufacturing which has produced enormous changes in the structure of the industry.

With the objective of improving their competitive positions, principally through the reduction of production costs, the larger automotive companies have, amongst others:

- i. made new investments in their traditional areas of manufacturing locations in the developed countries in order to modernize their production base,
- ii. changed the motor vehicle designs,
- iii. adopted new systems of labour organization,
- iv. intensified and embarked upon new forms of co-operation and associations with other companies,
- v. relocated production operations and redirected some new investment toward the developing countries where production costs are lower and
- vi. increased the practice of international sourcing of components.

Within this context of change new concepts, like that of the "world car", have developed. The world car was conceived as that which could be manufactured and sold in every part of the world adding only small modifications in the exterior design. The common and interchangeable use of key components produced in different parts of the world makes possible the maximization of economies of scale at the global level (Sinclair, 1983; Cohen, 1981). The clearest expression of this strategy was the Ford "Escort" and the General Motors "J" car. As a consequence of this trend the spatial level of decisions of location has ceased to be national in character and has become truly global (Bloomfield, 1978).

The types of co-operation and association between corporations acquired a wide variety in this period. This included joint ventures, capital cross-ownership, collaboration in components production, joint research activities, agreements for marketing and distribution and many other varieties. For some companies this practice was for reasons of market penetration, for others it was a defensive strategy of survival. An example of this tendency is the strategy of General Motors which signed joint venture agreement with Toyota for producing automobiles in the United States. General Motors having already

developed formal links with Isuzu (buying 34.2% of the Isuzu's capital) and Suzuki (buying 5.3% of Suzuki's capital). With this strategy General Motors is able to import small cars into the United States under its own branding. In the same manner General Motors started a joint venture with Daewoo, a Korean company, having acquired 50% of Daewoo's capital.

Another important aspect of this global reorganization is the geographical redistribution of manufacturing capacity away from the traditional centres of production. In 1950 the United States produced 76% of the global automotive output. By the middle of the 1980's, however, its global share had dropped to 25%. In the same period Japan's share of global automotive output grew from almost zero to around 30%. Similarly the global share of the developing countries (principally Brazil, Spain, Mexico, Argentina, India, Yugoslavia, and more recently South Korea and Taiwan) grew, in the same period, from around zero to more than 10%.

For the companies with a greater degree of internationalization a growing proportion of their global production was being concentrated in their foreign subsidiaries. For example Ford now has more than 50% of its production outside the United States. The recent operations set up by the global automotive companies were made not only to dominate the market of the host countries but were intended to be used as an export platform to the developed countries. This tendency is reflected in the dynamic growth of intra-firm trade, particularly the spectacular growth between developed and developing countries. For example in 1965 imports of engines to the United States from developing countries was less than 1% of the total. By the middle of the 1980's, however, Brazil and Mexico by themselves accounted for around 2/3ds of this category of import. Similarly the international sourcing of US based companies is not limited to car components but includes a growing tendency to import complete vehicles. It is estimated that by the end of the 1980's the percentage of captive imports of cars to the United States will reach 20% of total imports (Shaiken and Herzenberg, 1987). The bulk of these captive imports will come from newly industrializing countries (South Korea, Taiwan, Mexico and Brazil).

This process of geographical redistribution of world production capacity in the motor industry and the growing international integration of production and trade (which was accelerated by the slumps of the 1970's and early 1980's) were facilitated by a conjunction of factors (Harris, 1986). On the one hand the national factors within the developing countries included the improvement of their infrastructure and industrial bases plus higher levels of education, labour skills and health of their populations. In addition to these factors developing countries adopted specific subsidies and incentives designed to attract global production facilities. At the world level the factors contributing to a growing international integration were a reduction in the transport costs, the development of efficient global communications systems as well as the global liberalization of trade and tariff reductions associated with the formation of the European Community and the Dillon and Kennedy Rounds at the beginning of the 1960's. In summary this process of spatial dispersion of global automotive production has led to complex patterns of changing specialization which has interconnected different parts of the world in integrated production networks².

²For a more in-depth analysis of the globalization process in the manufacturing system and the resulting specialization, see Nigel Harris (1986).

III. The International Integration of Mexico's Motor Industry

Within the globalization process of the automotive industry, Mexico has been increasingly integrated into a worldwide system of operations. Mexico's geographical proximity to the United States -sharing a border of more than 3,200 kilometres-, the relatively low cost and high skill level of the labour force, the adequate industrial infrastructure and systems of transport and communications, in addition to the incentives offered by the government all make Mexico an attractive place for locating operations in the search for lowering costs of production. Furthermore, Mexico is already a country which has a high level of multinational production facilities, particularly those owned by the US capital (which controls over 50% of the market and production), and this facilitates further integration within Mexican and US plants (Table 1).

Table 1

Structure of the Motor-Vehicle Assembly Industry in Mexico, 1989

Company	Foreign Equity Participation	Shares (%) of:		
		Domestic Market	Total Exports	Total Production
Chrysler	100%	21.0	34.7	25.2
Ford	100%	19.6	20.2	19.7
General Motors	100%	16.3	20.6	17.6
Nissan	100%	21.5	12.8	18.8
Volkswagen	100%	19.3	11.6	16.8
Subtotal		97.7	99.9	97.5
Other companies		2.3	0.1	2.5
Total		100.0	100.0	100.0

Source: Elaborated according to AMIA's (Asociación Mexicana de la Industria Automotriz) statistics.

The key element in the new stage in the Mexican automotive industry is its technical-manufacturing integration at the international level. With this the Mexican motor industry forms part of a global system of production and implies for it a international division of labour which is progressively more specialized. It seems that the tendency is towards the formation of a unique North American production block (Canada, the United States and Mexico), defining more specialized roles for each one of the countries. In reality, what is generally considered as the integration of countries in the global production process is, from the point of view of the companies, only the integration of their own plants and markets.

IV. Stages of Development of Mexico's Motor Industry

Generally to explain the stages of development of the Mexican automotive industry the following periodization has been proposed³:

- i. The pre-industrial stage (1908-1962): This stage was characterized by the import of completely built vehicles (1908-1924) and subsequently assembly activities with imported parts or complete knock down kits (CKD) were practised through licence agreements or by subsidiaries of foreign companies (1925-1961).
- ii. The import-substitution stage (1962-1969): In this stage it was intended, through governmental intervention, to achieve a higher proportion of domestic content in the manufacture of the vehicle (this regulation specified that Mexican made parts must comprise at least 60% of the total value). Technically vertical integration was reversed in this period and there was a proliferation of "independent" Mexican owned companies producing parts. At the same time Mexican owned companies which had previously assembled cars under licence agreements were gradually displaced by foreign owned subsidiaries.
- iii. The export promotion stage (1969-present): This stage begins with the export of vehicles and components, in a direct and indirect way, through the final assembly sector.

Even though the periodization described above is a useful classification in functional terms, it is important to point out that it does not properly reflect the present stage of development of the Mexican automotive industry. This periodization is largely based on the sequence of governmental auto decrees (of 1962, 1969, 1977, 1983 and 1989). In reality governmental decrees are only part of the influences that affect an accurate periodization. As actually observed the stages of development do not coincide with the periods defined by these decrees. For example, despite the Mexican Government's decree in 1969 to expand automotive exports it was not until the 1980's that substantial exports were achieved. In addition the dividing line between the import substitution and export promotion periods is not, in reality, a useful one because import substitution and export promotion policies are not in contradiction to each other and, indeed, were adopted concurrently. Finally, the promotion of exports does not necessarily mean the practice of global technical-manufacturing integration (since the exported goods could register 100% of domestic content) which is, in itself, an important and distinctive stage of development.

To understand more precisely the new stage of development of Mexico's motor industry it is necessary to periodize making an adaptation of the different modalities of international integration as indicated by Harris (1983) and the internationalization of Marx's three circuits of capital, developed later by Palloix (1978) and Jenkins (1976):

- i. Trading integration (1908-1924): this stage is characterized by the import to Mexico of completely built vehicles and replacement parts. The vehicles distributed in the domestic market were fully assembled outside Mexico. This stage represents the beginning of the interchange relationships, the mere international circulation of commodities -the internationalization of the circuit of commodity capital.
- ii. Capital-investment integration (1925-1980): this stage comprises at least 2 functional phases of this sector's development. Firstly there was the establishment of assembly operations by foreign

³See, for example, the works of Camarena (1981), Dombois (1985) and Bennett and Sharpe (1985).

companies. Vehicles were assembled with components primarily imported from the industrialized countries which played host to the firms' manufacturing and management cores. The percentage of domestic supplied components did not exceed 30%. This period covered the years 1925 to 1965. In the second phase (1966-1980) vehicles were assembled with a growing domestic content intended to reach, as close as possible, to 100% (with a compulsory minimum of 60%).

In the whole 1925 to 1980 period the nature of Mexico's role in the international integration of the automotive industry was almost exclusively as a market for foreign produced replacement parts, components, and capital equipment imported from the firms' host countries. In this period the links between plants located inside and outside Mexico were the result of the firms' horizontal expansion. Towards the end of this period low volume exports were initiated to other developing countries. In summary, this stage represents the export of capital towards Mexico; that is to say the internationalization of the basic relations of production between capital and labour or the international movement of capital as a social relation -the internationalization of the circuit of money capital.

iii. Technical-manufacturing integration (1981 to present): this stage is characterized by a new wave of investment designed mainly to use Mexico as an export platform to developed countries. This produced a complex pattern of interconnections between plants located in Mexico and abroad. With this Mexico's motor industry forms part of a global system of production and the new plants were designed to operate on an internationally competitive basis. Output tends to be more specialized and the degree of domestic content decreases. This stage represents the international integration of the production process which is expressed in an increasing international circulation of intermediate products among plants and companies -the internationalization of the circuit of productive capital.

It is important to note that the three stages of international integration described above are distinct but not mutually exclusive. For example trade integration has continued to strengthen through all stages but with different flows and the nature of what is traded. Another point to consider is that governmental policy could have been determinant for the first two stages, however, in the present stage of development government policy has less influence on the performance of the automotive sector in Mexico than factors of a more global nature.

V. A Divided Industry

In conceptual terms the automotive industry of Mexico can be divided into two distinct sectors. The first sector produces for the domestic market, is in recession, has a high proportion of its productive capacity idle and has low investment and productivity. The second sector produces for the international market, is expanding, has a high proportion of its productive capacity utilized, and has high investment and productivity.

The first sector is composed of the car assembly segment oriented to the domestic market plus domestic autoparts manufacturers. The second sector is made up of vehicle and engine manufacturing for the export market, in-bond assembly activities (maquiladoras⁴) plus some autoparts manufacturing for export.

From the end of the 1970's the large multinational corporations programmed important investment for plants to produce nearly exclusively for the export market.

Table 2

Major Export-Oriented Investments in Mexico's Automotive Sector During the Eighties

Company	Location City (State)	Product	Installed Capacity(a)	% of Export	Dates of Start-up
General Motors	Saltillo-Ramos Arizpe (Coahuila)	Engines (6 cylinders)	451,200	80	1982
General Motors	Saltillo-Ramos Arizpe (Coahuila)	Car assembly	130,000	65	1981
Chrysler	Saltillo-Ramos Arizpe (Coahuila)	Engines (4 cylinders)	270,000	80	1981
Chrysler	Toluca (State of Mexico) (b)	Car and truck assembly	n.a.	n.a.	1985
Ford	Chihuahua (Chihuahua)	Engines (4 cylinders)	450,000	80-90	1983
Ford	Hermosillo (Sonora)	Car assembly	170,000c	100	1986
Nissan	Aguascalientes (Aguascalientes)	Engines (4 cylinders)	350,000	80	1983
Nissan	Aguascalientes	Car assembly	150,000	30d	1992

⁴The maquiladora programme allows temporary duty free entry of components and raw materials for their assembly in Mexico and reexport as final product. Correspondingly, the US tariff regulations 806.30 and 807.00 permit return of the US component portion duty-free, taxing only the value added in Mexico.

	(Aguascalientes)				
Renault	Gomez Palacio (Durango)	Engines (4 cylinders)	250,000	80	1984
Volkswagen	Puebla (Puebla)	Engines (4 cylinders)	440,000	85	1981
Volkswagen	Puebla (Puebla)	Car assembly	n.a.	n.a.	1991

Source: The information is based upon several sources of the automotive sector; own questionnaires and visits to plants.

a. Vehicles/Engines per year.

b. Conversion of its old plant.

c. Ford announced an additional investment of \$300 million dollars to reach an annual output of 170,000 by 1990. The original capacity of this plant was 140,000 units.

d. Estimated.

n.a. Not available.

In contrast to the traditional plants, the new plants were designed to operate with the latest technology globally available with the aim of making them globally competitive. For example, the Ford's car assembly plant at Hermosillo, Sonora, produces the "Tracer" based on the Mazda 323, and the "Escort", utilizing 128 robots, incorporating the latest advances in flexible systems of production. This plant applies at the same time both international sourcing of components and an internationally based "just in time" system of inventory and delivery. In a first stage, when only the "Tracer" car was produced, 60% of the components came from Japan (including the engine), 30% from Mexico and 10% from the United States. With the changes in the models produced for the year 1990 the supply composition changed in the following way: from Japan 25%, Mexico 15% and United States 60%. The principal cause put forward of this dramatic change in the country of origin of the components is the impact caused by the appreciation of the Yen against the U.S. dollar.

The performance of the segments producing for the national market (the sector "national-traditional") and the segments producing for export (the "international" sector) are totally opposite with regards to key indicators such as growth (Figure 1). In annually average terms while the national-traditional sector registered a negative growth of 4.2% in the 1980 to 1988 period, the international sector grew 34.8% for the production of automobiles, 55% for the production of engines and 14.8% for the number of in-bond plants. Some analysts of the Mexican automotive industry have suggested that the crisis of the national-traditional sector is a reaction to a great degree of the opening and dynamism of the new export plants. Without a doubt there is a connection between the diverging behaviour of the two sectors, especially if one bears in mind that a global trend towards booming export production in a slowly growing global market must cause a contraction of production somewhere. However, in the specific case of Mexico the negative rate of growth of the national-traditional sector can be nearly fully explained by the depression of the domestic market. These market conditions resulted in a loss of purchasing power within Mexico connected with the sharp economic crisis of the country from 1982 onwards.

Another way of looking at the growing international integration of the industry is through the analysis of the proportion of exports in relation to total output (Table 3).

Table 3

**The International Sector in Mexico's Motor Industry:
Key Indicators (1980-1988)**

Year	Export of Automobiles (Units)	Automobile Exports as a % of Total Production	Export of Engines (Units)	Engine Exports as a % of Total Production	Number of In-bond Plants
1980	13,293	4.3	43,000	12.9	53
1981	9,296	2.6	86,605	20.0	44
1982	14,142	4.7	320,301	42.8	44
1983	20,768	10.0	708,234	69.2	47
1984	30,397	12.4	1'157,551	74.3	51
1985	49,856	16.8	1'317,403	74.2	63
1986	40,216	19.3	1'325,163	78.7	80
1987	135,481	48.8	1'367,380	80.0	140
1988	145,119	41.0	1'400,000	78.0	160
Average annual rate of growth (1980-1988)	34.8%		55%		14.8%

Source: Calculated from the following statistical yearbooks: AMIA, La Industria Automotriz de Mexico en Cifras, Mexico, several issues; INEGI, Estadística de la Industria Maquiladora de Exportación, SPP, Mexico, several issues; and SECOFI, Directorio de la Industria Maquiladora de Exportación, Mexico, several issues.

In the segment of automobiles the proportion of output destined for export grew from 4.3% in 1980 to 48.8% by 1987 (dropping slightly to 41.0% in 1988) and in the segment of engines this proportion reached 80% in 1987. The export dynamism has transformed the automotive sector in Mexico from one which ran a huge trade deficit (accounting for 53.1% of the total balance of trade deficit in 1980) to one which now runs a substantial trade surplus (accounting for almost 80% of the total superavit) (Table 4). With these changes Mexico's automotive industry has become the second largest export sector after oil.

The growth in the number of maquiladoras assembling auto parts has also been spectacular. From 1980 to 1988 the average annual growth in maquiladora employment was around 40%. Annual growth, measured by value added, was almost 80%. The performance of this segment was rapid even in comparison to other booming areas. Although traditionally the maquila operations have been set up for making intensive use of labour there is recent evidence of an increasing technological level of the plants and resulting productivity gains (González-Aréchiga and Barajas, 1989).

Table 4
Trade Balance of the Automotive Sector in Mexico, 1980-1988 (Millions of Dollars)

Concept	1980	1981	1982	1983	1984	1985	1986	1987	1988
Total Exports (A)	15,307.5	19,380.0	21,006.1	22,312.0	24,196.0	21,866.4	16,031.0	20,656.2	20,657.6
Oil (B)	10,305.4	14,432.5	16,100.7	15,666.9	15,735.5	13,819.1	6,089.9	8,453.0	6,543.7
Non-oil (C)	5,002.1	4,947.5	4,905.4	6,645.1	8,318.1	8,047.3	9,941.1	12,203.2	14,113.9
Manufacturing (D)	3,030.1	3,427.3	3,167.5	5,447.9	6,985.6	6,720.6	7,782.1	10,588.1	12,381.3
Automotive (E)	403.3	456.1	531.0	1,083.0	1,558.2	1,591.9	2,268.7	3,295.2	3,513.4
% E/D = F	13.3	13.3	16.8	19.9	22.3	23.7	29.1	31.1	28.4
% E/C = G	8.1	9.2	10.8	16.3	18.7	19.8	22.8	27.0	24.9
% E/A = H	2.6	2.4	2.5	4.9	6.4	7.3	14.2	16.0	17.0
Total Imports (I)	19,431.0	23,929.6	14,421.6	8,550.9	11,254.3	13,460.4	11,432.4	12,222.9	18,903.4
Manufacturing (J)	16,947.6	21,018.2	12,956.1	6,644.2	9,121.6	11,532.6	10,202.2	10,771.3	16,747.0
Automotive (K)	2,594.0	2,576.3	1,252.2	666.5	722.6	1,062.6	839.3	1,331.9	2,137.5
% K/I = L	13.3	10.8	8.7	7.8	6.9	7.9	7.3	10.9	11.3
% K/J = M	15.3	12.3	9.7	10.0	8.5	9.2	8.2	12.4	12.8
Total Balance A-I = (N)	(4,123.5)	(4,549.6)	6,584.5	13,761.1	12,941.7	8,406.0	4,598.6	8,433.3	1,754.2
Automotive Balance (O)	(2,191.0)	(2,120.2)	(721.2)	416.5	667.6	529.2	1,429.4	1,963.3	1,375.9
(O) as % of (N)	(53.1)	(46.6)	-	3.0	5.2	6.3	31.1	23.3	78.4

Source: Own elaboration with data published by BANCAMEX (Banco Nacional de Comercio Exterior), Comercio Exterior, Mexico, Statistical Appendix,

several years; AMIA, La Industria Automotriz de Mexico en Cifras, Mexico, several years; and NAFINSA, La Economia Mexicana en Cifras, Mexico, several years.

General Motors installed its first in-bond plant in Mexico in 1978 and immediately was followed by Chrysler and Ford. General Motors estimates that it will run 50 in-bond plants in 1990. At the present time there are around 160 plants producing auto parts with 92,290 workers and a growing Japanese presence in this segment. In 1987/88 General Motors owned 13 maquila ventures with a total of 27 plants and 26,040 employees. In total the U.S. "Big Three" plus Honda accounted for 39 plants with 35,791 employees (Table 5 and Appendix). Compared to the total employment in Mexico's final assembly sector, the generated employment in the in-bond operations by the "Big Three" represents about 2/3ds of that figure.

Table 5

**Automotive-related In-bond Plants Installed in Mexico
by Selected Multinational Corporations, 1988**

Multinational Company	Number of Plants	Number of Employees
General Motors	27	26,040
Ford	7	5,991
Chrysler	4	3,636
Honda	1	124
Subtotal	39	35,791
Other Companies	121	56,499
Total (a)	160	92,290

Source:Elaborated according to data gathered from interviews and questionnaires applied to automotive companies, and complemented with the following sources: SECOFI, Directorio de la Industria Maquiladora de Exportación, Mexico, (various years); Revista Expansión, Mexico, (various years); and Carillo (1989: Appendix).

a. The total figures include those plants producing auto parts which are classified under the electronics sector in the official statistics.

VI. International Integration and Specialization: The End of the National Car

There has been an argument throughout this paper that the process of international integration has produced a more specialized role at global level for Mexico's motor industry. This feature is particularly clear when analyzing the engine sector. For example, already by the mid-1980's, Mexico was the source of around 40% of total internal combustion engine imports to the United States. Considering particular companies, it was estimated in 1985 that 25% of Chrysler's global engine output was manufactured in Mexico. In the same way, Ford uses Mexico to produce 450,000 small engines for import into the United States, which covers more than 50% of its demand for the 2.3 litre 4 cylinder engine used particularly for the Topaz model (Business Mexico, 1985). In addition to engine manufacture as a specialized niche a growing number of subcompact vehicles are being sourced from Mexico for the North American market. Amongst other technical factors, the country's geographical position offers competitive advantages to Mexico in this type of heavy and bulky goods (engines and vehicles) due to the short distances involved and the opportunity to use rail or truck shipment door-to-door (with the subsequent savings in time, cost, and journey time variability). In an important sense Mexico is playing in North America a similar role that Spain is playing in Europe.

Contrary to the traditional belief, those production segments in which Mexico is specializing are capital intensive, with some sectors of high technology, rather than those making use of intensive "cheap labour". There has also been an upgrading in the skill content of the labour force⁵. Paradoxically -and in opposition to the classical dependency view- it seems that, this new international role of Mexico's car industry instead of increasing its subordination to the multinational corporations or the United States, more than ever the american firms rely on their mexican facilities to remain competitive in a more and more aggressive global market.

Another indicator of the process of international integration is the decreasing proportion of domestic content of final output (which is the same as an increase in the import content) in the new export plants. Vehicles produced for export register only between 15 and 30% of local content and engines, between 40 and 50%. This situation also reflects the change in the objectives and priorities of governmental policy towards the automotive sector, which was forced upon it by the national economic crisis and by the global industrial restructuring.

The original governmental plan, embodied in the 1962 Automotive Decree, was to achieve a total domestic integration in the manufacture of a Mexican vehicle. This objective would be supported by an import substitution policy within which the manufacture of the engine would play a key role. The engine, however, that was planned to form the basis for import substitution and the national integration of the automotive sector during the 1960's and 70's had, by the 1980's, become the most important manufacturing export for all of Mexico. Ironically this was achieved during a period of increasing import content and increasing, rather than decreasing, international integration.

The latest automotive decree -published in December of 1989⁶-, explicitly shows a change in the governmental policy towards the whole sector. Through this action, the globalization trend of

⁵The same conclusions were pointed out by Palomares and Mertens (1987) in their analysis of Mexico's electronics, metal engineering and secondary petrochemicals industry.

⁶See Diario Oficial de la Federación, Poder Ejecutivo Federal, 11 of December, 1989.

the economy is recognized and an active and competitive insertion in the international markets is pursued.

The process described above has practically marked the end of a national dream: the manufacture of a car which in content and design is 100% Mexican or the "Mex-Car". The automotive policy in Mexico has shifted from the idea of manufacturing a "national car" to a growing participation in the "world car" strategy.

VII. Spatial Impacts of the Process of International Integration

In conjunction with changes in: 1) the composition of output, 2) the direction of trade, 3) the technological level and 4) the organization of the labour process, the process of international integration has produced changes (for the second time in its history) in the pattern of location of manufacturing capacity in Mexico's motor industry. A spatial deconcentration of capacity from the south-centre region to the northern region has been observed.

The developing economies which, like Mexico's, are on the path towards full industrialization are constantly transforming the composition of output and their labour force. In these types of economies the existing industrial capacity is not prepared to absorb an accelerated base of technological innovation nor expansion, such as the growth of high productivity sectors. As a result, changes in product characteristics besides an expansion produce changes in location (Harris, 1983). In this sense it is more efficient to invest in a new plant rather than converting an existing one since it possesses obsolete machinery, equipment and layout.

Among the main locational factors considered in the move to the north are the following: 1) proximity to the U.S. market and production base, which reduces transport costs; 2) easy access for technical assistance; 3) low cost and incentives in plant installation; 4) a qualified and more docile workforce; and 5) the possibility of imposing new and more flexible collective contracts and, in some cases, paying lower wages in relation to the old-southern plants.

Another aspect related to the northward shift in the location of automotive plants is that in the processes of international integration the border regions tends to be favourite areas for location (the territorial expression of such a process). In parallel to this geographic redistribution of Mexican automotive plants towards northern Mexico, within the United States a certain deconcentration is also occurring and has resulted in a Southern shift in the location of manufacturing capacity (from the traditional production area centred in Detroit to Tennessee, Pennsylvania, Kentucky and Indiana).

A. International Integration, Technological Innovation and Locational Change

Considering the periodization of different stages of international integration described above, it is possible to conceive corresponding changes in the technological- manufacturing nucleus⁷ and changes in the pattern of location.

As Table 6 shows the periods in which a qualitative jump in the technological-manufacturing nucleus has occurred has coincided with changes in the geographic location of facilities. The first qualitative jump occurred in the mid 1960's. This was the beginning of the manufacturing phase (as opposed to a purely assembly phase) in the development of Mexico's car industry and coincided with a geographical redistribution from the Federal District towards the adjacent States. As a result an important south-centre region of automotive manufacture was created where the bulk of production was destined for the domestic market. The second qualitative leap occurred in the early 1980's and was characterized by the beginning of the adoption of world class technologies of production as an outcome of a global technical manufacturing integration. This process resulted in a new geographic redistribution of production capacity towards Mexico's northern regions where the new production was largely destined

⁷The analysis of the technological-manufacturing nucleuses has been based on the work of Arteaga (1988) who describes technological changes and labour organization in Mexico's car industry.

for export to the U.S. market.

Table 6

Phases of International Integration, Technological-Manufacturing Nucleuses and Locational Changes in Mexico's Motor Industry, 1908-1990

Phase of International Integration	Technical-Manufacturing Nucleus	Location of Production Capacity
I. Trading Integration (1908-1924)	A manufacturing nucleus is non-existent; import to Mexico of completely built vehicles	--
II. Capital-Investment Integration (1925-1980)	<p>II. a) Assembling of vehicles with imported parts (CKD) or domestic supplied components not greater than 30% of the total cost. Intensive level in the use of workforce (1925-1965).</p> <p>II. b) The manufacture of the engine is incorporated (foundry, machining and assembly); domestic content greater than 60%; task segmentation of the workforce (1966-1980).</p>	<p>II. a) Mexico, D.F.</p> <p>II. b) State of Mexico, Puebla, Morelos and Hidalgo</p>
III. Technical-Manufacturing Integration (1981-to present)	Stamping process, robots and flexible systems of automation are incorporated; the domestic content of products decreases to levels of less than 20%.	Coahuila, Chihuahua, Durango, Sonora and Aguascalientes

B. Regional Concentration and Deconcentration

The change in the pattern of location of the manufacturing base towards Mexico's northern region, an outcome of the third stage of international integration, is among the major points of interest in this paper. Right up to the end of the 1970's, almost the whole of the automotive production was concentrated in the country's south-centre region (Table 7).

Because of factors previously indicated, however, there was from the early 1980's a substantial redistribution of production capacity in both engines and motor-vehicles (Tables 8 and 9). Excluding the limited production of heavy duty trucks, Mexico's northern region, which accounted for zero percent of the country's engine and car manufacturing capacity in 1980, accounted for almost 65% of capacity of engines and more than 30% of capacity for automobiles by 1988. If the growing number of in-bond automotive plants is added (around 160 in 1988 located mainly in the border fringe) it is evident that dramatic changes occurred in the geography of Mexico's motor industry during the last decade (Figure 2).

The relatively high degree of concentration of automotive-related activities in new areas of northern Mexico, such as the Saltillo-Ramos Arizpe complex, has given the area the nickname of "Little Detroit". This geographical deconcentration of Mexico's car-assembly and engine plants has also brought with it a certain dispersion of the autoparts producing companies. For instance, in order to supply Ford's car-assembly plant, in Hermosillo (Sonora) several suppliers have located there. Among these companies are Carplastic, Aurolin, Cima, Cisa, Goodyear Oxo, PPG Industrial, Mortell de Mexico and Quimica Parker, providing paint, axles, panels, electrical wiring systems, upholstery and tires, etc.

Table 7
Geographical Distribution of Mexico's Motor-Vehicle Production,
1970 (Percentages)

Location	Automobiles	Commercial Vehicles	Total
South-Centre region	100.0	97.1	99.2
Mexico City	16.9	29.1	20.0
Toluca	34.5	48.9	38.3
Cuernavaca	9.3	6.2	8.5
Puebla	31.3	0.2	22.9
Ciudad Sahagun	8.3	12.7	9.5
Northern Region	-	2.9	0.8
Saltillo	-	1.3	0.4
Monterrey	-	0.8	0.2
Mexicali	-	0.8	0.2

Sources: Elaborated according to AMIA's statistics, La Industria Automotriz de Mexico en Cifras, Mexico, 1972.

Table 8
Installed Capacity of Mexico's Car Industry by Regions, 1988
(Annual Vehicles)

Company	South-Centre Region (a)			Northern Region			Total
	Commercial Vehicles	Auto-mob iles	Total	Commercial Vehicles	Auto-m obiles	Total	
Chrysler	73,400	120,960	194,360	-	-	-	194,360
Ford	49,700	61,900	111,600	-	170,000 (b)	170,000 (b)	231,600
General Motors	60,480		60,480	-	130,000	130,000	190,480
Nissan	48,000	78,000	126,000	-	-	-	126,000
Volskwagen	22,000	129,800	151,800	-	-	-	151,800
Dina	25,784	-	25,784	-	-	-	25,784
Famsa	15,000	-	15,000	-	-	-	15,000
Kenworth	-	-	-	3,600	-	3,600	3,600
Trailers Monty.	-	-	-	438	-	438	438
Victor Patrón	-	-	-	2,400	-	2,400	2,400
Total	294,364	390,660	685,024	6,438	300,000	306,438	991,462
%	97.9	56.6	69.1	2.1	43.4	30.9	100.0

Source: Own elaboration according to AMIA's statistics, *La Industria Automotriz de Mexico en Cifras*, Mexico, 1988.

(a) comprises the Federal District, the State of Mexico, Hidalgo, Morelos, Queretaro and Tlaxcala.

(b) Programmed expansion for 1989/90.

Table 9

**Installed Capacity of Engines in Mexico's Automotive Industry by Type and Regions, 1988
(Annual Units)**

Company	South-Centre Region (a)			Northern Region			Total
	4 Cylinder	6 & 8 Cylinder	Total	4 Cylinder	6 & 8 Cylinder	Total	
Chrysler	-	169,646	169,646	270,000	-	270,000	439,646
Ford	-	100,000 ^b	100,000	450,000	-	450,000	550,000
General Motors	-	142,538 ^c	142,538	-	451,200	451,200	593,738
Nissan	144,000	-	144,000	350,000	-	350,000	494,000
Volkswagen	440,000	-	440,000	-	-	-	440,000
Renault	-	-	-	250,000	-	250,000	250,000
Dina	-	7,980	7,980	-	-	-	7,980
Famsa	-	10,000	10,000	-	-	-	10,000
Total	584,000	430,164	1'014,164	1'320,000	451,200	1'771,200	2'785,364
%	-	-	36.4	-	-	63.6	100.0
% within each type	30.7	48.8	-	69.3	51.2	-	-

Source: Own elaboration according to AMIA's statistics, *La Industria Automotriz de México en Cifras*, Mexico, 1988.

(a) Comprises the Federal District, the State of Mexico, Hidalgo, Morelos, Queretaro and Tlaxcala.

(b) Estimation based on production for the domestic market.

(c) Includes 4-cylinder engines.

C. A New Territorial Division of Labour

The geographical redistribution of automotive production capacity is not developing evenly, in terms of the segments or production lines. Although this is not a totally concluded process it is possible to notice an emerging pattern of regional specialization within Mexico:

- i. In general, in terms of the destination of output, plants located in the north produce for the external market and plants located in the south-centre region produce for the domestic market.
- ii. In terms of the type of product the northern region has specialized in the production of 4 and 6 cylinder engines, small and medium cars, light commercial vehicles and export parts. The south-centre region has been specializing in 6 and 8 cylinder engines, medium size automobiles and heavy duty lorries.
- iii. The level of integration between plants from one region to another is almost inexistent, a fact reflected in the minimum interchange of parts and components.
- iv. The plants located in the northern region are integrated to global international production and register a high level of import content in the final product. The plants in the south-centre region depend upon the domestic market and have a high proportion of local content.
- v. The technical level and automation of plants located in the north are considerably higher than those in the south-centre region.
- vi. The characteristics of the labour force are also different. In the northern plants the work force possesses a higher level of technical qualifications than the labour force in the south. Also the industry's management perceives that the northern labour force is more open to changes in the organization of production which provides a higher flexibility to the firm. This aspect is reflected in the existence of different clauses within the union agreements covering the workforces of the two regions.

Furthermore, it is possible to identify a geographical selectivity in the firms' locational decisions within the northern region, an aspect which basically depends on the technical requirements of production. To set up car assembly or engine manufacturing activities all the companies chose places that can be ranked as "intermediate" or medium size cities. At the moment of taking investment decisions these localities had populations of between 250,000 to 500,000 inhabitants. Cities receiving plants in this category were Saltillo-Ramos Arizpe, Chihuahua, Gomez Palacio, Aguascalientes and Hermosillo. The most striking conclusion one can draw from this rapid growth of many different centres of production in relatively small cities and towns is that the importance of agglomeration economies as a factor in locational choice is in sharp decline in the new global technical-productive system.

The in-bond plants which produce auto parts and components have a different pattern of location. They have been set up mainly in the border cities and towns although there is a tendency towards a "concentrated deconcentration" to the small towns and medium sized cities which are not necessarily "border towns" but are still relatively close to the border. The geographic location of some of these in-bond plants in the smaller cities and towns has been considered as part of a "rural industrialization". One of the reasons for the tendency of the in-bond plants to locate in the smaller Northernmost border towns, rather than the traditional border cities, is the possible saturation of the industrial infrastructure and pool of skilled labour force. Another possible reason is the lower level of labour union organization and militancy in the smaller towns.

It is important to note that although there is a definable territorial division of labour, which is in great part the expression of differences between plants built in different phases of development of Mexico's automotive industry, there is a tendency towards a certain homogenization in the technological level, automation, productivity and labour organizational systems. This tendency is expressed in the recent conversion of the following plants located in the south-centre region: Chrysler's plant in Toluca, Volkswagen's at Puebla, Nissan's at Cuernavaca, and Ford's at Cuautitlan.

Finally, this territorial division of labour within Mexico has to be considered as a part of a more global division of labour, in particular a regional-spatial specialization at the level of North America (as indicated in section VI). Thus, production units in northern Mexico and industrial centres in the United States produce specialized goods for a unique production base and market⁸.

⁸This correlation between the spatial distribution of in-bound plants in Mexico and industrial and commercial centres in the United States has been analyzed by Barajas-Escamilla (1989).

VIII. Conclusions: A New Basis for a Policy of Decentralization and Regional Development

- i. The analysis of the changing pattern of location of Mexico's motor industry shows the importance of factors different from those traditionally considered in the field of industrial location. This is the case of the process of international economic integration. Frequently, non-spatial or sectorial factors have a deciding influence on the locational decisions of productive facilities. In the case of Mexico's northern region the peso/dollar exchange rate and aspects of free trade have recently had an enormous influence. The continuing devaluation of the peso has substantially reduced the cost of labour. In addition the existence of the U.S. 806 and 807 tariff provisions allow non-American companies to avoid trade barriers. It is possible that the expectation of a trade block being formed (linking Mexico, the United States and Canada) is one of the factors behind the increasing Japanese investment in northern Mexico. In such a case the Japanese companies would already be established inside an emerging North American protected market (and in an area of that market with low labour costs).
- ii. While government policy has had an impact in this process of geographic dispersion of the Mexican automotive sector its role has not been vital. The Mexican government has been pursuing the deconcentration of economic activity (of industry in particular) away from Mexico's central area for more than three decades, with only minimum success. Traditionally, the existing diseconomies in the MAMC and the improvement in industrial infrastructure in peripheral regions have not influenced, by themselves, manufacturing deconcentration. Programs like industrial estates, new towns, fiscal incentives and the determination of priority geographical zones have been available. However, in some of the automotive sector examples of northern investment, support from the three levels of government came only after the company had selected the particular location. Furthermore, some of the more peripheral towns that companies chose to locate were outside the areas that the government thought possible to industrially develop. This means that the governmental policy and actions have followed the process rather than directed it.
- iii. The international technical-manufacturing integration has affected the spatial distribution of economic activity in Mexico favouring productive facilities closer to the U.S. manufacturing heartland rather than the geographic, population and economic centre of Mexico itself.
- iv. These new economic and spatial tendencies have two interesting effects on the ability of governments to affect industrial location decisions. Central government finds itself squeezed between the growing internationalization of the companies' decision-making process on the one hand and the increasing deconcentration of the location of manufacturing capacity (independent of state planning or control) on the other. The deconcentration of location to the regions opens the opportunity for local and regional governments to bargain directly with the multinational companies. This opportunity increases regional calls for economic and political autonomy as they seek to become agents of their own regional economic development.
- v. The analysis of the latest development of Mexico's motor industry also provides the basis for the design of a regional policy considering what has been called "strategic commodities" (Harris, 1983). The justification for this approach derives from the need to plan jointly the economic space and the geographic space. Different manufacturing sectors have different and changing locational characteristics. Even within the same sector factors of location vary, depending on the specific type of commodity.

A more detailed understanding of the performance of specific forms of the production of goods (for example, cars, engines, minor components, etc.) would enable a more accurate determination of relevant locations within the governmental planning process. In his methodology Harris suggests the practice of determining regional specializations through the identification of "strategic commodities". This is with the aim of identifying the future role of the region and the base for the regional orientation of the governmental agencies.

vi. From a national point of view the geographical dispersion of the automotive sector from Mexico's south-central region represents a relative concentration in Mexico's northern region. This trend will probably require in the immediate future the same, or greater, planning attention than that already expended on efforts of decentralizing Mexico's central area.

The decade of the 1980's has seen a dramatic change in the locational pattern of multinational investment in Mexico's northern region in both absolute and relative terms to Mexico's more traditional central area. Based on the present tendency, it seems that the deconcentration of industrial capacity will continue during the 1990's. Perhaps northern Mexico will eventually emulate the Catalonian region of Spain which has a standard of living "closer" to that of France than its own nation. Such a "convergence" with the type of U.S. industrialization for northern Mexico would place severe strains with relationships between the traditional manufacturing centres and the new industrial regions, regarding the allocation of public resources. This necessarily leads to new approaches in the formulation of regional development policies.

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