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**THE DETERMINANTS OF INDUSTRIAL GROWTH ACROSS  
MEXICAN REGIONS. A REVIEW OF THE EMPIRICAL  
EVIDENCE AND THE ROLE OF PUBLIC POLICIES**

## *I. Introduction*

The empirical research analyzing the determinants of observed interregional shifts of production and business location decisions concentrates overwhelmingly on developed nations, mainly the U.S. This research field in the U.S. has been stimulated by the persistent, and over time significant, shift of manufacturing production (away from the traditionally dominant Northeast and Upper Midwest and toward the South and Far-West) that has taken place since the postwar period, and accelerated throughout the 1960s and 1970s (it continues up to the present). Many studies related to this field are explicitly designed to evaluate the impact of public policy variables.<sup>1</sup> The policy significance of these studies is unambiguous as economic development efforts by state and city governments invariably focus on attracting new and expanding existing industry—insofar as additional industrial activity is associated both with employment and personal income growth. Tax and expenditure policies are the traditional means of intervention, although labor market policies and a variety of direct financial and technical assistance programs are not uncommon.

In Mexico, the severe economic recession throughout most of the 1980s was accompanied by an accelerating decline in the share of the Metropolitan Area of Mexico City (MAMC) in manufacturing. In contrast, amidst the prolonged recession, some Northern cities showed an impressive growth performance in manufacturing. A well above-average growth was also recorded in some states/locations within the Central and Central-west regions. Hence, the differential in absolute levels of manufacturing output between the MAMC and the few other major cities, and between the latter and a group of dynamic mid-sized cities narrowed visibly, even though it is still enormous. In contrast, manufacturing growth in the Southern states remained sluggish.

In fact, since the early 1970s the concentration of manufacturing in the MAMC had started to decline in relative terms. Manufacturing production had been expanding at rapid rates in some Central-region mid-sized cities (in the MAMC's immediate hinterland), since the early 1960s. In the lagging East and South, industrial activity accelerated throughout the 1970s, based on the exploitation of their important oil resources by the federal government. Maquiladora operations, initiated in the mid-1960s, had been expanding across the northern border cities, except for a contraction in the mid-1970s. But it was not until the 1980s that a

<sup>1</sup> Surveys of recent inter-area econometric studies for the U.S. include Newman and Sullivan (1988), Gerking and Morgan (1991), and Wasylenko (1991). All of them put a special emphasis on the findings related to the impact of business taxes and/or economic infrastructure on industrial location.

turning point occurred in the traditional pattern of regional concentration in manufacturing (mainly in the MAMC) that accompanied the accelerated industrialization of the economy throughout the period 1940-1970.

The empirical work related to the determinants of industrial growth across regions/sites in Mexico is very limited. It is confined to a few qualitative studies carried out during the 1960s, and a smaller number of survey-based and econometric studies accomplished in the 1990s. The early studies focused on analyzing the locational advantages of the MAMC *vis-à-vis* other major regions as a whole, and conjectured about the extent to which these advantages could be associated with the increasing share of the MAMC in manufacturing. However, no measurement or quantification of the relative impact of these particular advantages was produced. Perhaps motivated by the tendencies toward regional deconcentration during the 1980s, the few recent studies analyze industrial location decisions and inter-area growth determinants outside of the MAMC. Based on direct information from owners/managers, survey studies derive rankings of various locational factors, while econometric studies using statistical measures of these factors produce assessments of their isolated impact.

The primary objective of this research paper is to review and contrast the results of these investigations in a way that yields some insight into the determinants of the regional pattern of manufacturing growth. Particular attention is given to the deconcentration stage and the role of public policy variables. It proved to be very difficult to draw definite conclusions on the basis of the quite limited number of studies and their quite dissimilar methods and design—even studies using similar methods do not bear close relationship to each other as they are designed to answer different questions. Nevertheless, some preliminary inferences could be drawn on the basis of this analytical review, which appears to be the first one in the subject for Mexico.

The remarkably little attention received by this research field in Mexico can be understood in light of the traditionally high regional concentration of economic activity, the weak federal policies for industrial deconcentration, and the severe fiscal constraints faced by most state governments which has kept them from playing more than a minimal role in industrial promotion so far. Nevertheless, the policy significance of and interest in this field is likely to increase as Mexico's manufacturing space continues expanding rapidly, and as the number of states governed by the political opposition and the representation in the federal Congress of partisan forces advocating the financial autonomy of the states continues to grow significantly. In fact, during the 1990s, an unprecedented number of state governments have become quite active in promoting industrial growth within their jurisdictions.

The rest of the paper is organized as follows. A second section consists of a discussion of the conceptual framework for the analysis of inter-area industrial

growth differentials, and how specific market and cost factors, including public policy variables, are conventionally hypothesized to affect, *ceteris paribus*, the growth of industry across regions/sites. The third section contains the review of the empirical literature on business location decisions and inter-area industry growth. Here I begin with a discussion of the methodological characteristics of these studies. Then I proceed with an analysis of the principal findings. The contribution of the early studies is synthesized in the first part, whereas the last part is devoted to the analysis of the survey and econometric studies and thus, emphasizes the factors that have recently stimulated industry growth outside of the MAMC. In a final section, I draw some conclusions on the relevance of the market and public policy variables for current business location decisions and their implications for state development policy. As expected, for Mexico the impact of public policy variables on regional industrial growth remains an open question.

## ***II. An Analytical Framework***

In general, inter-area studies assume that the expansion of economic activities in a given region depends on the region's relative profitability, which in turn is defined as a function of its access to both the required inputs of production and output markets. Hence, insofar as market and cost factors differ across regions, so do potential profits and industrial growth. Differentials in regional profitability thus are presumed to cause differentials in the rate of industrial expansion among regions. Underlying this relationship is the location decision of the profit-maximizing firm which is described as a function of relative potential profits at alternative regions/locations—as firms are assumed to seek regions/sites with relatively high returns, inter-area differentials in the rate of return induce inter-area shifts of production.

The following is a discussion of how specific location factors (or regional attributes) are generally hypothesized to affect, *ceteris paribus*, the relative profitability of regions and, thus, their relative growth performance. These different factors are organized here into three categories: 1) factors affecting access to markets, 2) factors affecting costs and, 3) public policy-related factors. Needless to say the effect (importance) of each factor varies from one industry to another depending on particular production characteristics, and also within the same industry depending on firm size.

### *Factors Affecting Access to Markets*

Access to markets is affected by both the demand for the firm's output and the firm's ability to supply. The demand is characterized by the size and income of the

population if the firm produces for consumer markets. If the firm supplies industrial inputs, the demand is usually described by the number and size of firms purchasing these inputs. The firm's ability to supply is characterized by the number and size of existing competitors. It is presumed that a particular region or location would be more attractive for industry the larger the demand for the firm's kind of output and the lower the nearby supply, i.e., the larger the market access. Market access thus is hypothesized to have a positive effect on industry growth.

### *Factors Affecting Costs*

Costs are a function of the prices of different inputs used in production (e.g., labor, land, utilities, industrial inputs and equipment). Firms however not only consider prices of inputs but also their productivity, i.e., input costs per unit of output. A relatively well paid but highly productive labor force, for instance, may result in a labor costs/output ratio lower than what could be achieved with low paid but inefficient workers. That is, the impact of wages on labor costs is determined by the productivity of the work force. Hence firms would be willing to pay higher wages for skilled workers if that would improve the firm's overall efficiency. Likewise, firms may be willing to pay more for higher-quality, reliable utilities and other services. Therefore, it is presumed that a highly productive, dependable labor force rather than only relatively low wages enhance the attractiveness of regions for production. Likewise, the attractiveness of regions is improved by high-quality, reliable utilities rather than only by relatively low utility prices. That is, industry growth is assumed to have a positive relationship with the productivity of labor and other inputs, and to vary inversely with wages and prices of other inputs. The cost of capital (i.e., equipment) usually is not considered to be a factor in location decisions or a determinant of interregional differentials in industry growth because it does not vary significantly from one region to another.

Unionization has often been regarded as a factor imposing additional costs on firms either directly through strikes and operations slow downs or indirectly through restricting managerial discretion on work rules. For instance, overhead costs are likely to be higher, on the average, in regions with relatively high levels of unionization and very active unions insofar as organized labor constrains firms' decisions on hiring, firing, lay offs and overtime. Similarly, the pressure on firms for increases in wages and benefits are expected to be higher the stronger the unions and the higher the unionization rates. Thus, firms are presumed to prefer "non-union" locations, *ceteris paribus*, i.e., unionization and union activity are assumed to have a negative relationship with industry growth.

Local or nontransferable inputs (e.g., land, climate, water and air quality, topography, soil structure, etc.) also affect the cost of doing private business. For instance, less costly open-air operations are possible in warm sunny climates and

construction costs are likely to be lower in flat plains. Likewise, workers may be willing to accept lower wages in locations with more natural amenities insofar as they appreciate living in a pleasant environment. Empirical support for this hypothesis has been provided by Beeson and Eberts (1989). Therefore, an adequate supply of these nontransferable inputs is presumed to enhance the attractiveness of regions for industry. These types of inputs are then hypothesized to have a positive impact on industry growth.

Transfer costs of inputs and outputs basically depend on distance and weight. Holding all other factors constant, industries are presumed to seek those locations originating the least ton-miles (weight) in the process of delivery of outputs and procurement of inputs (i.e., where transport costs are minimized).<sup>2</sup> The market potential (markets in all other regions) that a particular industry may achieve by locating in a particular region also depends on the distance to those other regions (in terms of transfer costs) and on how well the region in question is connected to the major transportation networks.

Agglomeration economies certainly can confer cost-savings on firms through specialization and scale economies. When a firm locates within a cluster to supply industrial inputs or components that otherwise each purchaser within the cluster would have to produce itself, these purchasers (subcontracting firms) become more specialized. It follows that for a given level of output, the subcontracting firms will have lower expenses in fixed capital and labor, i.e., the productivity of inputs is enhanced. (This presupposes that the combined demand for those inputs within the cluster was enough to make the supplier firm's investment worthwhile.) If specialization enables the subcontracting firms to realize internal economies of scale, subsequent increases in the rate of output will be accompanied by decreasing average total costs.<sup>3</sup> As a result of these gains in production efficiency, average total costs within the cluster may also decrease at each rate of output, because output from specialized firms (used as inputs in other firms) will be available at lower costs. The per unit cost of inputs will fall for any buyer of these outputs (many of those buyers are likely to be members of the cluster). Likewise, average total costs are reduced insofar as any savings in transfer costs are realized by members of the cluster. Additional sources of economies include the possibility of reduced inventories (i.e., the frozen capital attached to these inventories), of improvements in labor

<sup>2</sup> The location of minimum transfer costs would be closer to the market than to input sources if the ton-miles originated in delivery of output are higher than those originated in procurement of inputs and vice versa. However, if the activity in question involves more than one source of transferable inputs and/or more than one output market we can no longer be sure about which force prevails unless there is a predominant weight which is at least equal to the sum of all other weights.

<sup>3</sup> Average total costs of labor, management, marketing and research tend to decrease with increasing size to the extent that these expenses tend to increase at a slower rate than production. Thus these indivisible factors can be utilized more intensively as size increases, at least up to a finite size.

productivity resulting from specialization of workers' tasks, the increase of labor supply and enlargement of the variety of skills. Therefore, it is presumed that a particular region would be more attractive for industry the larger the size of its agglomerations, which depend on the average size of the clusters. That is, agglomeration economies are hypothesized to have a positive impact on industry growth.

### *Public Policy Factors*

Economic development efforts by state and city governments focus on attracting new and expanding existing industry insofar as additional industrial activity is associated both with employment and personal income growth. Tax and expenditure policies are the traditional means of intervention, although labor market policies and a variety of direct financial and technical assistance programs are not uncommon.

Corporate income and property taxes have a negative direct impact on profits at least initially. Firms may be able to shift the tax forward to consumers or backward to labor, but even when a firm shifts the tax to consumers, it may end up losing market if the demand for the product is not perfectly elastic.<sup>4</sup> It follows that profits may also decline. Taxation on personal income affects the availability of labor insofar as it induces migration of workers. An increase in the tax rate thus may result in higher labor costs. Therefore, it is presumed that a particular region would become more attractive for production if it offers an advantage in relative tax rates on capital and individuals, i.e., taxes are hypothesized to have an inverse relationship with industry growth. The importance of tax rates must be expected to differ, just like other costs, by type of industry and firm size.

Public infrastructure could be regarded as a direct productive input for which firms do not pay directly on a per unit basis as they do for private inputs. That is the case for facilities that have an active part in the operation of an economy such as roads, streets, bridges, airports, water treatment, etc., which can actually lower the firms' operating costs. As observed by Eberts (1991), any firm entering a region which has constructed that infrastructure immediately benefits by entering profits or rents according to the value of the contribution of public capital to production. Other types of public infrastructure may reduce labor costs indirectly by enhancing the location's amenities. For instance, households may be induced to accept lower wages in exchange for locating in a more attractive environment of superior educational, cultural, health care, and recreation facilities. Based on cross-section data of American cities, Beeson and Eberts (1989) provide evidence that relatively low wages are partly the result of high amenities which increase the supply of labor.

<sup>4</sup> Newman and Sullivan (1988) discuss how the effect of taxes on capital in a general equilibrium setting depends on the differential mobility of factors as well as on factor substitution and product demand elasticities.

Therefore, it is presumed that the higher the government expenditures in public infrastructure (or the larger the additions to the stock of public infrastructure) the more attractive a location becomes for production. That is, public expenditures in infrastructure are assumed to have a positive relationship with industry growth.

Recently, it has been hypothesized that in the U.S., key military facilities exert certain attraction on supplier firms derived from cost and market advantages. Markusen (1991) argues that the location of defense contractors in proximity to key defense facilities could be critical for using these facilities, free of charge, as a testing site for innovations, which could lower costs. Proximity to a key defense facility may also give the firm's operators early warnings of shifts in strategies and weaponry requirements and, thus, an advantage in terms of allowing a head start adaptation. Proximity may also permit firms to more easily recruit former military personnel whose knowledge may substantially improve marketing and design. Moreover, Markusen argues, by permitting its employees to engage in daily contact with the defense facility personnel, a firm might increase its chances of winning future contracts. Furthermore, the role of defense facilities in the location of the defense industry may have become stronger since the post war period due to the increasing sophistication of cold-war weaponry and defense systems whose production is made to highly detailed specification. Contractors are more beholden than they were in mass-production war-time to their clients' requirements. Therefore, locations hosting key defense facilities can be particularly attractive for the production of weaponry and defense systems. In other words, the location of a key defense facility in a given region can be presumed to have a positive relationship with the growth of the defense and other high-tech industries in that region.

Since the early 1980s great efforts have been made to explain the locational dynamics of high-technology industries (i.e., industries with an above-average percentage of engineering and technical work force), which appear to have been largely avoiding traditional industrial areas. High-tech industries, typically semiconductors, biotechnology, computers and software have thus been recently associated with the interregional shift of production into the "sunbelt" of the U.S. They tend to arise in small urban areas, sometimes near to a very large Metropolis. The analytical framework of classical location theory and the profit maximizing firm has been applied by many of these studies, and a recent survey on the topic by Towse (1990) indicates that the factors deemed to be decisive for the location of high-tech activity include quality of life, business climate, research-oriented universities, accumulation of scientific and technical work force and, as discussed above, military and government research establishments.<sup>5</sup>

<sup>5</sup> There is a rival approach according to which classical location theory does not offer scope for explanation of whole new sectors of production in the economic landscape of today (Towse 1990). As seen by Scott and Storper (1987), the explanation is to be found in the division of labor in



### III. The Empirical Evidence

I begin this review with a description of the methodological characteristics of the studies dealing with interregional growth and business location decisions in Mexico. Then I proceed with an analysis of their principal results which will serve to build a priori expectations regarding the effect and importance of regional attributes on industry growth that can be potentially tested.<sup>6</sup>

#### *Characteristics of the Studies*

Empirical research and evidence on interregional industrial growth and business location decisions in Mexico is limited to a few early qualitative studies and a smaller number of relatively recent survey-based and econometric studies. The early studies use a combination of descriptions of regional statistics, unstructured interviews with local entrepreneurs and government officials, and field observations. These techniques allowed researchers to arrive at plausible conjectures regarding both the locational advantages of Mexico City *vis-à-vis* other major regions as a whole, and the association of these advantages with the concentration of industry in Mexico City throughout the period of accelerated industrialization, 1940-1970 (Lamartine 1960; López Malo 1960, Ch. 4 y 5; Lees 1965; and Bassols 1979).<sup>7</sup> However, no measurement or quantification of the relative impact or importance of such advantages can be produced from that type of study.

Studies based on survey-questionnaires (addressed to plant managers/owners) use direct information to produce rankings of the most influential regional attributes or locational factors for the location choice. This type of study, however, usually covers only a few regions/sites or industries because the costs it implies in terms of time and budget are high. For the case of Mexico, perhaps motivated by the gradual expansion of Mexico's manufacturing space since the early 1970s, their focus has been on the factors driving the location decision outside of Mexico City (Galbraith *et al.* 1990; Vleugels 1990; Quintanilla 1991; and Garza 1992).

production, structures of inter-firm transactional activity, and agglomeration economies that arise endogenously out of localized forms of development.

<sup>6</sup> This review of the empirical evidence constitutes the point of departure for a subsequent project in which the relationship between interregional industrial growth and the most relevant market and public policy variables will be tested empirically for the period 1988-1994. This paper will serve precisely to identify the decisive locational factors or attributes.

<sup>7</sup> Some of these works are extensive, highly detailed studies on the evolution of Mexico's regional development which include analyses on the evolution of the regional pattern of manufacturing growth. The period analyzed by Lamartine (1960) and López Malo (1960) ends around the mid-1950s, and Bassols (1979) updates the analysis including data of the 1975 industrial census.

The survey-studies by Vleugels (1990) and Garza (1992) rely on samples of plants located in industrial parks invariably adjacent to mid-sized cities. The former analyzes the location decision in Central-region cities/sites, and assesses the importance of relocations from Mexico City *vis-à-vis* local start-ups for manufacturing growth in these Central-region cities. The latter covers sites within several regions of the country other than Mexico City, and distinguishes between city-specific and site-specific location factors. All the plants in Vleugels' sample were established between 1970 and 1985, and most of Garza's were established between 1970 and 1987.

Other survey-studies have addressed specifically the location decision of maquiladora plants at northern border locations. Galbraith *et al.* (1990) surveyed a sample of plants located in the Tijuana-Tecáte area (bordering California), the largest concentration of maquiladoras. This study includes only plants operating in the electronics industry and distinguishes between regional (Tijuana-Tecáte area) and site-specific searches. The survey by Quintanilla (1991) covers 85 percent of the maquiladora plants located in the State of Tamaulipas' three border cities (bordering Texas), most of which were established after 1972.

The econometric work on interregional (inter-area) industrial growth associates interregional differences in the number of new plants (micro-studies) or in the growth of output, employment or income (macro-studies) with interregional differentials in measures of market and factors affecting production costs (which are presumed to capture differentials in regional profitability). The central assumption is that the expansion of economic activities in a given region depends on the region's relative profitability, which in turn is determined by its market access and supply (price and availability) of inputs. Most inter-area studies of this type are based on cross-sectional data available at the state or metropolitan area level. The structure of multiple regression models applied in these studies is based on either equilibrium or disequilibrium-adjustment modeling. The estimation strategy of the former basically consists of associating changes in measures of regional industry growth over a period with lagged changes in regional attributes, whereas that of the latter relates changes in the measures of industry growth to levels of regional attributes at the beginning of the period analyzed.<sup>8</sup>

<sup>8</sup> An equilibrium model assumes that differences in industry growth across regions occurs when the equilibrium is disturbed by changes in the factors affecting demand or costs (i.e., changes in relative profitability across regions). As observed by Newman and Sullivan (1988), changes in the regional variables are treated as exogenous disturbances of equilibrium, with the observed adjustment of output across regions operating to restore equilibrium. The restoration of equilibrium usually is specified with a lag, due to the short-run mobility of capital. On the other hand, the disequilibrium model assumes that industry growth across regions occurs as industry moves to areas with above-equilibrium profit levels (i.e., as the effect of disequilibrium at the beginning of the period). This reflects the idea that investment decisions are experienced over a time span of several years. A

Apparently, for the case of Mexico, there are only two studies related to this research field applying multiple regression analysis (Ramírez 1995; and Tamayo 1996). The micro-study by Ramírez (1995) analyzes the location decision of automobile plants, and how it is affected by the utilization of flexible manufacturing systems.<sup>9</sup> This study applies different binary-choice models in which the dependent variable—location—takes the value 1 if the “north” option is chosen and 0 if the “not north” option is selected. It uses eight composite explanatory variables.<sup>10</sup> These variables are first constructed based on data from a sample of forty-nine plants located in North (27) and Central (22) Mexico, and then only on data from the north plants plus other eight second-tier suppliers located also in the North. Reportedly, the sample of North plants covers 60 percent of all the auto-plants located in that region, and accounts for 85 percent of Mexico’s export volume—engines, vehicles and auto-parts. In contrast, the plants located in Central Mexico are largely oriented to satisfy domestic demand.

The macro-study by Tamayo (1996), explores the underlying causes of interregional differentials in manufacturing growth for nineteen 4-digit level

situation of equilibrium exists when the interregional differentials in the factors that affect profitability are not large enough to make production shift across regions.

<sup>9</sup> Flexible systems are characterized by production schedules that can be quickly changed through computerized equipment. These production systems entail the use of multipurpose equipment, i.e., programmable machines that perform either multiple functions or a single function for different product configurations (Schoenberger 1987, p. 202). This equipment has come to facilitate changes in the product and production mix that, in turn, allows prompt reaction to changes in demand. Thus it constitutes a powerful competitive weapon. Flexible systems have come to affect the location decision insofar as traditional capital-labor relations and subcontracting relationships are redefined. They entail the development of the “polyvalent” worker, who embodies a range of skills and is able to perform multiple tasks in a given area of production—these workers thus can be constantly reallocated as the production schedule changes (Schoenberger 1987). Hence, firms producing with these systems need to ensure a highly cooperative regime of labor relations and tight control over the labor force. Subcontracting practices are taken to the fullest extent, leading to a vertical disintegration of the production process which, in turn, requires tight productive networks and interdependencies (Sabel 1989). Proximity between the leading plant and its suppliers thus becomes critical. On one hand, suppliers receive advice on how to use technologies, quality control, and organization of just-in-time deliveries. On the other, they share responsibility in designing components and delivering defect-free products just-in-time.

<sup>10</sup> These eight explanatory variables were created from the categorization of twenty-nine nominal variables (basic location factors) resulting from a survey of auto-plants’ managers. The initial step was to group these twenty nine location factors into eighth composite or block variables. Then, these block variables were factor-analyzed and the resulting factor scores used as the data for the independent variables. The eight block variables were identified as: 1) firms’ corporate strategies (FCS), 2) firms’ decision to enhance their share of the Mexico-US market (MMA), 3) government restrictions and incentives faced by the firms in their base-country (GCI), 4) pressures on the firms to segment the production process geographically (EP), 5) Mexico’s factors of attraction (AF), 6) regional supply of traditionally-trained low-skill labor force (FT), 7) influence of traditional (weberian) location factors (FW) and, 8) firms’ application of just-in-time flexible production systems.

industries. It focuses on how the impact of public policy variables fare *vis-à-vis* the effect of factors over which the government has no control. Real manufacturing value added is the measure of manufacturing growth (dependent variable), and measures of market potential, labor costs and productivity, agglomeration economies, and tax and public investment are included as independent variables. The units of analysis are the 31 Mexican states plus the Federal District. A disequilibrium-adjustment model is the basic framework of analysis (see footnote 8). The estimation technique applied is seemingly unrelated equations (SUR). The analysis is carried out for two time periods, 1970-1980 and 1980-1988. The analysis thus permitted a systematic comparison of parameter estimates over periods and across industries.

### *The Contribution of the Early Studies*

The early qualitative studies (Lamartine 1960; López Malo 1960; and Bassols 1979) analyze the conditions behind the increasing economic and demographic concentration in either the Metropolitan Area of Mexico City (MAMC) or the whole Central region, that accompanied the process of industrialization of the Mexican economy between 1940 and 1970. These studies all infer that such conditions originated during the pre-revolution period 1875-1910. First, most of the railroad network that exists today was developed during that period, and it was oriented to connect Mexico City with the primary produce industry (first-processing of mining and agricultural commodities) that had achieved certain importance in some Central-region and Northern locations. The network reached the northern border cities, as the production of primary commodities was largely exported to the U.S. In contrast, the railroad connection to the South remained rather underdeveloped, largely because of this region's lack of mineral resources, mountainous topography, and remoteness from the U.S. market.<sup>11</sup> The spatial configuration of the railroad network thus had a marked differential impact among regions. It further strengthened the economic dominance of Mexico City which since the pre-Revolution period was already the largest urban concentration with a population four times as large as that of the second largest city (Guadalajara), and the most sophisticated urban infrastructure (Hernández 1985, p. 65). The economic activity of some central and northern locations was also positively impacted by their connection to the railroad.

With the exception of first-processing industries which had developed mostly in a number of Central-region and Northern locations, the incipient industrial development was also concentrated in Mexico City. There were important

<sup>11</sup> The connection between the Yucatán Peninsula railroad and the North system was not accomplished until 1960.

exceptions though. Particularly notorious was the development of the basic metals industry in the Northeast, which took advantage of the exploitation of important nearby sources of coal and iron. The basic metals industry was mostly concentrated in the City of Monterrey and, to a lesser extent, in Monclova and Piedras Negras. Monterrey's intermediate position between the largest national market (Mexico City) and export markets in the U.S. was also critical for its dynamic economic growth performance. Of much less economic consequence was the development of export commodities (first-processing industries) in Northwest locations. The economic activity of Guadalajara and, to a lesser extent, a few other minor cities in the Central-west region also achieved some relevance, particularly consumer goods industries largely oriented toward the domestic market.

At the onset of the period of accelerated industrialization (during the 1940s), the MAMC was Mexico's most important concentration of economic activity, population, and hence income.<sup>12</sup> Its predominance would be further strengthened thereafter. A decisive factor was the development of the national highway system, which followed the same spatial configuration as the railroad. Since the early 1930s, the development of the highway system was given priority over the extension and improvement of the railroad network. Thus the MAMC became the hub of the national communications network, largely oriented toward the north. The important northern cities, however, were not, and still are not, well interconnected with each other, and the connection to regions south of the MAMC remained rather underdeveloped.

The early stage of development of the production-distribution system of crude and fuel-oil started by the late 1930s. The production centers, for obvious reasons, had to be established in the oil-rich region (Gulf of Mexico), while the distribution infrastructure was oriented to supply the largest industrial agglomerations in which the demand was heavily concentrated. Hence, Mexico City and its conurbated area, by far the main consumption center, also had the most important distribution center in terms of potential capacity and volume handled, and was supplied from the Tampico and Poza Rica refineries. The distribution center of

<sup>12</sup> Between 1930 and 1950, the share of Mexico City in national manufacturing output value remained stable around 30 percent. It was distantly followed by the states of Veracruz (Gulf-east) and Nuevo León (Northeast), whose shares during the same period leveled-off around 10 and 8 percent, respectively. The vast region of the northern states bordering Texas, as a whole, had achieved some importance since the late 1930s. Altogether the states of Nuevo León, Coahuila, Chihuahua y Tamaulipas accounted for more than 20 percent of national manufacturing output value in 1945 and 1950. Their individual shares ranked within the top seven in these census years (López Malo 1960, Table 15 and Graph 11). It should be noted that manufacturing activities within that quite extensive region have traditionally been concentrated in a few urban areas. Other states with a somewhat important manufacturing activity were Mexico and Puebla (within the immediate area of influence of Mexico City) as well as Jalisco (Central-West). The output value shares of these states ranked within the top ten. Throughout the 1950s the state of Mexico showed a marked upward trend, whereas Puebla experienced a pronounced decline (López Malo 1960, Table 15 and Graph 11).

Monterrey with connection to the nearby Saltillo, supplied from Tampico (fuels) and Reynosa (gas), was the second most important. By the early 1960s, there were only other two important extensions of the network connecting some cities in the Central-west and Southeast regions.<sup>13</sup> Vast regions of the country were not, and still have not been reached. Undoubtedly, the spatial coverage of the fuel-oil and gas production-distribution systems enhanced enormously the attractiveness for industrial production of those regions that were already the most industrialized.

The interregional allocation of public investment in urban infrastructure (e.g., water supply and sewerage systems, electric power, traffic routes, low-income housing, etc.) tended to concentrate in the MAMC, while investment in interstate highways and railroad was largely allocated in the northern states. Public investment in land irrigation systems also favored the latter. In short, throughout the period 1940-1970 the allocation of public investment was biased toward the most industrialized states, while remaining rather insignificant among the lagging states of the South and Southeast. Palacios (1989) shows that between 1970 and 1982 the bulk of public investment in economic and social infrastructure was still allocated in the most industrialized states, and that the inter-state distribution of such investment has a significant direct correlation with the inter-state distribution of gross national product. Such a pattern has not shown significant changes throughout the 1980s and early 1990s according to Cabrero (1997).

The process of regional industrial concentration implied a considerable and persistent rural-urban migration which largely consisted of migration out of agriculture.<sup>14</sup> In general, internal migration was quite responsive to employment opportunities, largely found in the fast-growing industrial activities within urban areas.<sup>15</sup> The fastest average population growth rates between 1940 and 1970 were observed in the border cities of Tijuana and Mexicali. The growth rates of these

<sup>13</sup> A distribution center based on Salamanca's refinery (supplied from Poza Rica) with connections to the cities of Guadalajara, Aguascalientes and Morelia in the Central-west region; and a connection among Pemex City (production), Minatitlan's refinery and the Seaport of Salina Cruz in the Southeast.

<sup>14</sup> According to Unikel (1976), the net movement of rural population to urban areas was 1.65 million from 1940 to 1950; 1.75 million during 1950-1960; and 2.75 million between 1960 and 1970. On the average, these movements represented 8 percent of the Mexican population at the beginning of the respective periods. Greenwood (1978) reports that the percentage of the labor force in agriculture declined from 54.2 percent in 1960 to 39.4 percent in 1970, while in absolute terms the agricultural work force fell by almost one million workers, reflecting largely a sizable and persistent migration out of agriculture. Bustamante (1983) cites official sources indicating that between 1950 and 1970, the percentage of the labor force in manufacturing increased from 15 to 22 percent, while that of agriculture declined from 60 to 41 percent.

<sup>15</sup> There is econometric evidence (Greenwood 1978) that during the period 1960-1970, greater rates of employment growth both significantly discouraged out-migration and significantly encouraged in-migration. Moreover, states with relatively high unemployment rates and with relatively high rates of unemployment growth were characterized by significantly greater out-migration rates.

cities were much faster than those of the MAMC, Guadalajara or Monterrey. However, by far the largest absolute population increments were observed in the MAMC and, to a lesser extent, in Guadalajara, Monterrey and Puebla, in that order.<sup>16</sup> The supply of labor, indeed, represented an additional and very important growth factor for these areas.

In summary, as the industrialization process proceeded, the tendency of industrial activity to concentrate in the MAMC and, to a lesser extent, in Guadalajara and Monterrey (Mexico's second and third largest cities) became stronger.<sup>17</sup> Manufacturing activity elsewhere remained rather limited, except for a third-tier group of cities with a long industrial tradition such as Puebla (Central region), León (Central-west), and the seaports of Veracruz (Gulf-east) and Tampico-Madero (Gulf-northeast). During the 1960s, manufacturing growth accelerated in a number of mid-sized cities located in the immediate area of influence of the MAMC, as well as in the northern cities bordering the U.S. As inferred from the preceding discussion, this regional pattern of manufacturing growth was strongly shaped by the spatial configuration of the national transportation network,<sup>18</sup> which in turn responded to the objective of strengthening the internal and external linkages of leading industries in the pre-industrial stage of national development. Eventually, the spatial allocation of public investment in infrastructure was driven by the objectives of national industrialization and aggregated efficiency. As observed, the development of the national highway system, crude and fuel-oil production-distribution system, and urban infrastructure responded to these objectives. The consequent rural-urban migration also came to enhance the advantages of the few leading urban-industrial centers.

<sup>16</sup> Some figures may be necessary in order to illustrate the dimension of these changes. Between 1940 and 1970, the populations of Tijuana and Mexicali increased from 16,486 to 341,067 and from 18,775 to 276,167, respectively; while the populations of the Metropolitan Areas of Mexico City, Guadalajara, and Monterrey increased from 1,802,679 to 8,797,031, from 283,879 to 1,516,209, and from 190,074 to 871,493, respectively, during the same period (Bustamante 1983, Table 3).

<sup>17</sup> The share of Mexico City in manufacturing value added increased from 32.8 percent in 1945 to 48.6 percent in 1970 (Garza 1983, Table VI-6). In absolute terms, Mexico City's real manufacturing value added increased from 1,049 to 18,287 million pesos between 1940 and 1970 (Garza 1983, Tables A-5, A-6, A-14, and A-15).

<sup>18</sup> Some important urban centers declined economically while other cities acquired economic momentum depending on whether or not they were connected through the railroad network. Hence the composition of the group of the twenty five largest cities experienced great changes between 1875 and 1910. In contrast, the composition of such group remained virtually unchanged between 1910 and 1970 (Hernández 1985, p. 63, citing World Bank sources).

### *Defining the Specific Locational Advantages of the MAMC*

The preceding discussion based on the early studies of interregional industrial growth approaches the conditions behind the pattern of concentration of economic activity and demography as a process. By framing these important economic development conditions within the explicit logic of the location decision of the profit-maximizing firm, it could be inferred that economies of agglomeration, market potential, and stock of public capital have been the most important specific locational advantages of the MAMC *vis-à-vis* the rest of the country.

*Economies of Agglomeration.* The large concentration of industrial activity in the MAMC provided the conditions for an increasing specialization of processes and thus the realization of scale economies—i.e., the large industrial cluster within the MAMC allowed for increased efficiency through the continuous division of labor between large operation units, each performing a specialized function.<sup>19</sup> In addition, location within the MAMC's large cluster of plants originated savings in transfer and inventory costs. Firms located there also secured access to a large pool of labor and variety of labor skills, as well as to specialized public and private business services.<sup>20</sup> The supply of managerial talent is also substantially greater. The considerable strength of the factors embedded in the concept of agglomeration economies pulling toward concentration of economic activity in the primate city has also been documented for other newly industrializing countries.<sup>21</sup> Some of the other

<sup>19</sup> Brown and Burrows (1977, Ch. 2), argue that the peculiar strength of these forces promoting concentration in countries at early stages of industrialization, is largely due to both the small size of the national market for any given manufacturing product in relation to the minimum economic size of the plant for producing that product, and the poor infrastructure of power, transport, and other public services in most locations.

<sup>20</sup> As Alonso (1975) argues, uncertainty is more predictable and less risky when spread over large numbers. That is "large numbers permit much greater flexibility and adaptability to changing and often unforeseen circumstances because more opportunities are open" p. 79. Hence, he also contends that because of their agglomeration economies, the major urban-industrial centers represent the safest seedbed for new industries. In newly industrializing countries, even those industries already well established and standardized in developed countries, are "new" in the sense that they undergo a period of adaptation in terms of personnel training at all levels, adjustment of technology to a more labor-intensive environment, market penetration, etc. Thus most of these "new" operations can be expected to locate, at least initially, in the major cities, just as in developed economies.

<sup>21</sup> Kwon (1981) reports that in 1977, Seoul accounted for 28 percent of value added, 25 percent of employment, and 32 percent of the number of establishments in Korea's manufacturing. Seoul's share of total population increased from 7.3 to 20 percent between 1955 and 1976. According to an official survey used by that author, agglomeration economies has been the most important factor for the locational choice in Seoul as ranked by business managers. Particularly critical have been the savings in transfer costs, the access to a large range of public and private services, the face-to-face contact with government officials and bankers, and the easy interfirm communication and coordination of processes. These elements of agglomeration economies were



factors discussed below could also be considered as important elements of agglomeration economies, but for clarity of exposition they are treated separately.

*Market Potential-Central Location.* It is clear that the MAMC became the most efficient location for the distribution of consumer and intermediate goods in the national market at large. On one hand, it constituted by far the main market as population, economic activity and hence income concentrated there. On the other hand, such location would minimize transport costs for most industries as it was the point at which all the main routes of the national transportation network converged. Moreover, because of the configuration of the transportation network (centered around the MAMC and lacking direct connections among other important cities), the MAMC became the central location even for industries which assemble inputs from dispersed sources. The only exception was the first-processing of agricultural commodities, a weight-losing process whose location is strongly tied to the location of sources of these materials as it reduces transport costs significantly. Hence, these industries have developed mostly in northern locations.

*Public Capital Stock As Private Input.* As the concentration of manufacturing production and population in the MAMC increased throughout the period of national industrialization, so did public investment in economic and social infrastructure in order to accommodate the dynamic industrial growth and the large inflows of population. Public infrastructure could be regarded as a direct productive input that reduces the costs of doing private business—private firms do not pay for these services on a per unit basis. Hence firms located within a region that possesses this type of infrastructure benefit according to the value of the contribution of that infrastructure to their production. Thus, the MAMC, with the most complete and sophisticated infrastructure, became highly attractive as a location for manufacturing production. As was described, the MAMC and a few other important cities benefited from considerably higher and more reliable supply of fuels, gas, and electric power, which is critical for any production process. In contrast, vast regions of the country still lack connection to the production-distribution network. Likewise, highways connecting to the MAMC still are superior to these in other areas. In short, a self-reinforcing cycle (economic and demographic growth – additions to the stock of public capital) achieved a considerable inertia.

*Access to Key Decision-makers.* It is also emphasized, in these early studies, how the location in Mexico City of the federal government, coupled with the lack of standard administrative procedures and a traditional personalization of contacts, pulled firms toward the MAMC. A similar effect is attributed to the highly centralized decision-making of financial assistance services from private and development banks. In short, in Mexico as in many other developing countries

followed by the personal preferences of owners/managers for metropolitan living, and the availability of highly qualified personnel. Of less critical importance were the access to raw materials, the access to consumer markets, and the availability of labor, in that order.

characterized by highly bureaucratic institutions and personalized contact with public and private administrators, the application of discretionary rules and regulations proved to be a factor of particular importance for the location of businesses. That factor added to the advantages of the MAMC, the seat of the federal government and most large private companies' headquarters.

*A Note on the Inertia of the Historical Patterns of Growth.* The range of possible locations to be considered by businesses is constrained by the considerable inertia of the historical pattern of urban-industrialization, as proposed by Friedmann (1966, Ch. 6).<sup>22</sup> The proposition is that the urban hierarchy, or at least that of the largest cities, exhibits a remarkable stability over time, which is largely determined by physiographic features (influencing the early location pattern of industry and population), the functional role of the urban centers in national development, and the much faster rate of expansion of urban areas relative to rural ones. It is argued that, despite the development of communications among large cities and interregional economic linkages as the process of national development proceeds, the traditional pattern of urban-industrialization and the characteristics of the urban-rural linkages would not change significantly. That is, once the urban-industrial hierarchy is established, it tends to be perpetuated and significant modifications can be achieved only over rather long periods of time.

It seems clear that the inertia of Mexico's fundamental urban-industrial structure (i.e., the unrivaled dominance of the MAMC and, to a lesser extent, of a few other urban areas), initially shaped in the pre-revolution period and considerably reinforced throughout the period of accelerated industrialization (as can be inferred from the early studies reviewed above), indeed magnified the MAMC's initial advantages *vis-à-vis* the rest of the country. From the perspective of the profit-maximizing firm, the range of potential locational alternatives is severely constrained by the factors underlying that historical spatial structure. Despite the industrial deconcentration trends observed since the early 1970s and strengthened throughout the 1980s and early 1990s, it is clear that the traditional pattern of urban-industrial growth in general remains strong, reflecting somehow the still powerful influence of its most important determinants (discussed above) on current location decisions.

<sup>22</sup> Friedmann reaches that conclusion analyzing the case of Venezuela through an inductive approach. A generalization of the conclusions is possible, to the extent that Venezuela's pattern of urbanization and industrialization and its determinants resembled closely those observed in most Latin American economies. That study, a classic of regional planning, focuses on the relationship between the pattern of spatial integration of the national economy and the "take-off" stage of national development— i.e., the process of urbanization, the consolidation of Caracas as the central location, and the eventual emergence of secondary clusters of cities in the vicinity of both Caracas and the Seaport of Maracaibo (West). The period analyzed, 1950-1960, actually covers only the early phase of what could be called the "take-off stage" in Venezuela.

### *The Principal Findings of Recent Studies*

Perhaps motivated by the emerging deconcentration tendencies, a few survey-based and econometric studies analyzing industrial location decisions and inter-area industry growth outside of the MAMC have recently appeared. Some insights into the effectiveness of both the fiscal incentives for industrial deconcentration (introduced in the early 1970s and revised in 1979 and 1984) and creation of economic infrastructure have resulted. An obvious shortcoming is that the public policy variables have been evaluated as a broad package, rather than on a disaggregated basis. The analytical review of results will be undertaken after having outlined both the main elements of the industrial deconcentration strategy and the observed pattern of industrial deconcentration. The organization of this review is by location factors or regional attributes rather than by author as is usually done. In this way, it will be readily apparent whether or not the importance assigned to particular factors or attributes is consistent across studies.

*The main features of the industrial deconcentration strategy.* The industrial deconcentration policy in Mexico has largely relied on inductive measures operating through fiscal and financial incentives, and subsidized prices of public services and energy. The first regionally differentiated scheme of fiscal incentives addressing industrial deconcentration was enacted in 1972. It was revised subsequently in 1979 and 1984 in terms of the differentiated treatment between congested and high priority areas, and their definitions. Regarding the treatment of the *highly congested areas*, no incentives were granted in the three largest urban-industrial areas (Mexico City, Guadalajara and Monterrey) under the 1972 decree, nor in Mexico City and its conurbated and/or adjacent municipalities under the 1979 and 1984 revisions.

The definition of the promoted or *high priority zones* has become more specific with each revision. The 1972 decree implicitly assumed a broad most-favored zone identified as "rest of the country" which only excluded the three largest industrial cities and their adjacent municipalities. Tax rebates on imports of equipment, business income, and transfer of property ranging from 60 to 100 percent were granted to both new plants and relocations from the three largest urban-industrial areas. Under the 1979 decree, the national high priority zone included the municipalities wherein the most important industrial seaports, other selected coastal and interior cities, and major northern border cities were located. It comprised other nearby municipalities as well. In addition, there was a high priority zone comprising municipalities with a high industrial potential to be selected by each state government. New plants, relocations, and expansions in these two high priority zones were entitled to the best tax rebates. These tax incentives were quite similar across both zones—the only noticeable difference was the exclusion of capital goods industries and processing of agricultural products in the latter. There was no specific treatment for the cities of Guadalajara and Monterrey.

The high priority zone specified in the 1984 decree comprised also a large number of municipalities where mid-sized cities, industrial corridors and axes were located. There were cities classified as high priority zone in virtually every state other than those surrounding the metropolitan area of Mexico City. As in the previous decree, there was another high priority zone comprising a relatively reduced number of municipalities chosen by state governments and federal government jointly. New plants and expansions were entitled to receive tax rebates of 20 to 40 percent in the former and ranging from 15 to 40 percent in the latter. Relocations from highly congested areas were entitled to the same benefits plus a fiscal credit for up to 25 percent of both relocation costs and relocated assets. The 1984 decree also introduced a quite intricate industry-specific criteria based on a perceived regional specialization in order to determine the extent of the mentioned incentives.

The "belt" of municipalities surrounding the highly congested areas has also received a particular treatment. The 1972 decree entitled relocations from the three largest industrial cities to their adjacent municipalities and new plants established in the latter to tax rebates on imports of equipment, business income, and transfer of property ranging from 50 to 100 percent (only slightly lower than the 60 to 100 percent offered in the promoted "rest of the country" zone). The 1979 decree specified a zone comprising a group of municipalities surrounding Mexico City (and its conurbated municipalities) in which new plants and expansions were granted the same incentives as in high priority areas except in capital goods industries and processing of agricultural commodities. The 1984 decree also established a zone comprising both a group of municipalities surrounding Mexico City and conurbated areas, and the whole metropolitan areas of Guadalajara and Monterrey. Tax rebates ranging from 20 to 30 percent were granted in that zone but only for expansions of small and mid-sized industries and relocations from Mexico City and conurbated area. As noted earlier, relocations from that highly congested area were entitled to fiscal credits amounting up to 25 percent of relocation costs and relocated assets in addition to the incentives granted in the recipient zone.

There is a commonly heard opinion that the different regional divisions and attached incentives have suffered from design inconsistencies limiting their effect on deconcentration (Bustamente 1983; Palacios 1989). For instance, it has often been suggested that because of the minimal incentive differentials between the "belt" surrounding the highly congested areas and the promoted or high priority zone, particularly under the 1972 and 1979 decrees, it is very likely that any deconcentration should have taken place mostly in the former. However, despite of the plausibility of these opinions and conjectures, they remain rather superficial. So far there is no solid empirical support to substantiate the effect of the policies described in a more precise way.

Besides the fiscal incentives, there have been other important policies and programs framed within the industrial deconcentration strategy. A fund created in 1953 to financially assist small and mid-sized industry (FOGAIN) adopted the consecutive regional divisions applied for tax incentives in order to set interest rate differentials—according to Lavell (1972), FOGAIN already applied a slightly higher interest rate in the three largest urban-industrial centers before 1972. The general contention among analysts is that the magnitude of the interest rate differentials has been far from sufficient to promote deconcentration in a meaningful way. But again, no empirical support has ever been provided to make that broad assertion more precise.

The maquiladora regime was created in 1965 to promote the industrialization of the northern border cities. Basically, it entitles plants to duty-free imports of intermediate inputs and equipment provided that a high proportion of their output is exported. Initially, the application of these incentives was restricted to the 20-kms. strip parallel to the border with the U.S., but since 1972 it was extended to the rest of the country except for the metropolitan areas of Mexico City, Guadalajara, and Monterrey. The domestic sales allowance has also been relaxed considerably. Nevertheless, by far most of the explosive growth experienced by the maquiladoras since the mid-1980s has been concentrated in the northern border cities—their traditional location—in which these operations' contribution to manufacturing output and employment is quite significant. Another important program was created in 1971 to establish industrial parks equipped with housing projects and commercial areas. It is operated through a development bank (NAFINSA), and its objective is to provide adequate industrial space outside of the few main urban-industrial cities to facilitate deconcentration. The empirical evidence, however, indicates that the program's contribution to deconcentration has been quite limited. Aguilar (1993), which is probably the most complete evaluation so far of the role of industrial parks in industrial deconcentration, concludes that the program, at best, has contributed to induce some deconcentration toward the most immediate area of influence of Mexico City.

*The major interregional shifts of manufacturing production.* A recent analysis of the changes in the interregional distribution of manufacturing for the sector as a whole and for nineteen 4-digit industries over the years 1970, 1975, 1980, 1985 and 1988 has been carried out by Tamayo (1996).<sup>23</sup> As shown in that study, between 1970 and 1980, a moderate shift of production away from the preeminent

<sup>23</sup> The states comprised in each of the regions are: Federal District and México (Capital); Hidalgo, Morelos, Puebla, Querétaro and Tlaxcala (Central); Colima, Guanajuato, Jalisco and Michoacán (Central-west); Aguascalientes, Durango, San Luis Potosí and Zacatecas (Central-north); Nuevo León and Tamaulipas (Northeast); Chihuahua and Coahuila (North-central); Baja California, Baja California Sur, Nayarit, Sinaloa and Sonora (Northwest); Tabasco and Veracruz (East); Chiapas, Guerrero and Oaxaca (South); Campeche, Quintana Roo and Yucatán (Yucatán Peninsula). This regional division was adopted from Hernández (1985), where the respective rationale can be found.

Capital region as well as from the three northern regions and largely toward the Central region, i.e., the immediate hinterland of the Capital region, the East, and the South was the most visible movement.<sup>24</sup> The industry-specific analysis reveals that a large part of the shift toward the Central region was accounted for by industrial chemicals, machinery & equipment, and automobiles—three large and fast-growing industries. The Central region's relative increase in the first two of these industries was at the expense of the Capital region, whereas that in automobiles was at the expense of both the Capital region and the North (Tamayo 1996, Ch. 6).

During the 1980-1988 period, the shift of manufacturing output away from the Capital region became very pronounced, although such a downward trend abated by 1985. The most sizable observed shifts were toward the North-central and Central-west regions, in order of importance, which lasted throughout the 1980s and probably continues up to the present. There were also visible but less significant shifts toward the Northeast and, as in the previous decade, toward the Central region.<sup>25</sup> Automobiles, electric machinery & equipment, machinery & equipment, and electronic equipment are the most significant industry-specific cases of the large northward shift. The shift toward the Central-west region was accounted for by a diversity of intermediate goods industries, notably lumber-plywood-timber, miscellaneous metallic products, leather & leather products, and rubber and plastics (Tamayo 1996, Ch. 6).

*On the Importance of Access to Markets.* Vleugels (1990) reports that "access to markets," as ranked by business managers, has been the single most important locational factor in the Central region. In this study, "access to markets" implies proximity and an excellent highway connection to Mexico City and/or a good location within the national highway system that facilitates serving important national markets. Consistently, the same study found that Mexico City is by far the main output market for plants located in Central-region cities, followed by the regional market —market in other states within the same region. Local output markets —markets within the state where the plant is located— are much less important.

Garza (1992) reports that, overall, state-local output demand has a moderate-to-low importance in the location decision. A low level of state-local competition is, in general, the lowest-rated factor. However, the importance of each of these two factors is inversely related to plant size. That is, local output markets and a low

<sup>24</sup> The share of the Capital region in national manufacturing output declined from 54.6 to 50.8 percent throughout the decade, whereas that of the Central region increased from 6.7 to 9.5 percent. The share of the northern region altogether declined from 22.3 to 19.9 percent, whereas these of the East and South, combined, increased from 5.4 to 8.5 percent (Tamayo 1996, Table 7).

<sup>25</sup> The Capital region actually experienced negative growth. Its share in national manufacturing output declined from 50.8 to 38.3 percent. The share of the North-central region increased from 4.6 to 9.9 percent, and that of the Central-west from 8.4 to 11.7 percent (Tamayo 1996, Table 7).

level of local competition (i.e., local market access) are crucial or very important for the location of very small firms. Consistently, this study reveals that the majority of surveyed plants have national markets (i.e., markets beyond the region where the plant is located and other than Mexico City) and the Mexico City market as their main output markets. These are followed closely by export markets in the U.S. and Canada. Local-state demand is the least significant—73.4 percent of the surveyed plants have no sales in the city where they are located, and only 12.5 percent sell more than 15 percent of their output in their respective host-locations.

Unfortunately, access to either national, regional or export markets was not considered directly in Garza's survey and hence in the ranking of location factors. Nevertheless, that study provides some indication that these extra-local markets are relevant for the location choice. For instance, plants that serve mostly national markets (including Mexico City) appear to be established in strategic locations within the national highway system, with relatively good transport access not only to Mexico City but also to other important national markets. Those plants having Mexico City as their main output market tend to be located in Mexico City's immediate area of influence—largely within the Central region. Similarly, most plants located at border sites, as expected, have their main output market in the U.S. The same study reports as well that plants located in traditionally important industrial cities (other than Mexico City) appear to have particularly important regional output markets.

In agreement with the high importance of access to national markets found by survey studies, the study by Tamayo (1996) which applies a multiple regression technique, indicates that for the period 1970-1980, market potential stimulated output growth in most (13) of the nineteen manufacturing industries analyzed.<sup>26</sup> In addition, that study found that such stimulus, in general, is much stronger for durable and intermediate goods industries than for consumer goods industries. Automobiles, electronic equipment, industrial chemicals, rubber & plastics, and paper & allied products exhibited the strongest tendency to increase production in states with high market potential—i.e., states within the Capital and Central regions. It is also shown, as expected, that such tendency is rather weak among industries whose location is strongly tied to the location of natural resources such as lumber-plywood-timber and primary metals.

However, there is some indication that during the 1980-1988 period, market potential was no longer a factor. According to Tamayo (1996), most of the minority of industries that experienced growth in that period of economic crisis either were

<sup>26</sup> In that study the market variable was defined as a "potential" variable by taking into consideration the markets in all other states discounted by distance, as in standard gravity-models. This approach recognizes that for a particular state it is not only the market within its own boundaries that stimulates the growth of its industry, but also the distribution of markets in all other states weighted by the distance with respect to each of them (reflecting transport costs).

insensitive to inter-state market potential differentials (e.g., automobiles, textile mill products, clay & pottery, and lumber-plywood-timber) or showed a tendency to expand the most in states with low market potential (e.g., rubber & plastics and cement-gypsum-plaster).<sup>27</sup> The strong tendency to expand production in states with high market potential was offset, if not reversed, by the severe contraction of the domestic market which is concentrated in the Capital and Central regions. In addition, there was a far-reaching reorientation of important industries toward export-markets in response to either an increasing foreign competition, balance of payments requirements or changes in corporate strategies to increase competitiveness in the U.S. market, which prompted a northward shift of production.

Regarding that issue, Ramírez (1995) provides econometric evidence that the decision to locate an auto-plant in North Mexico is positively and strongly influenced by a factor he called "producing for export" (it was computed through factor analysis). Two of the four composite variables that weighed heavily on that factor as named by the author are: 1) firms' corporate strategies, and 2) firms' decision to enhance their share in the Mexico-US market (as deemed by the original survey-factors embedded in these two variables, they actually reflect, as a whole, the corporate strategies to enhance competitiveness in the North American market).<sup>28</sup> Consistently, the results of qualitative studies (UN-CTC 1992, Shaiken 1994) reveal that the locational shift of the automobile industry toward the North was prompted by changes in the corporate global sourcing strategy of US-based firms aimed at improving their competitiveness *vis-à-vis* Japanese cars in the American market.<sup>29</sup> It

<sup>27</sup> The period 1980-1988 was one of sluggish growth for the Mexican manufacturing sector—negative value added growth for ten of the nineteen industries studied. As noted by the author, only the results of industries that experienced growth can be used to support inferences regarding the determinants of regional industrial growth. It should also be noted that, as in the previous period, some growth-industries (i.e., paper & allied products and glass & glass products) continued showing a significant attraction toward states with a high market potential (i.e., the Capital- and Central-region states).

<sup>28</sup> The survey-factors included in the first composite variable are: 1) to increase share in the US-Canadian market, 2) to increase share in the Mexican market, 3) to increase export-production of Mexican subsidiaries to become balance-of-payments neutral, 4) enlarge operations in other members of the Free Trade Agreement, and 5) become suppliers of the largest assembly-plants. The second composite variable includes: 1) proximity to research centers, suppliers and markets in the US and Canada, 2) avoid trade restrictions, 3) avoid excessive trade tariffs and quotas, and 4) partners' interest in investing in Mexico (see Ramírez, *Ibid.*, Table 1).

<sup>29</sup> According to the UN-CTC document, since the beginning of the 1980s, even before the abrupt contraction of the Mexican economy, Ford, GM, and Chrysler had initiated investment projects in Mexico in order to increase production capacity for assembling engines and vehicles for intra-firm exports to the US. The bulk of that additional export-capacity has been taking place through the expansion and creation of new facilities in northern locations. Such strategy was enhanced by the 1983-sectoral program of the Mexican government allowing affiliates to reduce domestic content provided that their exports increased commensurately, which was aimed at making the industry "balance-of-payment neutral".



is clear that the northward movement implied an advantage in terms of distance to the U.S. market and parent firms, relative to alternative locations further south in Mexico, i.e., lower transport costs and timely coordination of operations. The impact of this movement on the local economies has been significant.<sup>30</sup> Likewise, a survey-study (Quintanilla 1991) reports that what the author simply calls “border location factor” (which appears to reflect advantages derived from proximity to parent firms and markets in the U.S.) dominates the ranking of the maquiladoras in each of the three border locations covered in that study.

*Input Sources.* Regarding the supply of inputs, Garza (1992) reports that overall state-local input sources have a moderate-to-low importance in the location decision, which however varies inversely to plant size. That is, state-local supply of inputs are quite important only for very small firms. Garza also consistently reports that the demand of most plants for *industrial inputs* is satisfied from foreign sources (U.S. and Canadian), Mexico City, and other national suppliers, in order of importance. Local and regional supply of industrial inputs is the least important. The only clear exception to this pattern are the plants located in Mexico’s second largest industrial city (Monterrey), which present relatively strong local linkages. Likewise, the same study found that a high proportion of the surveyed plants either do not use *raw materials* or only use a minor proportion relative to total inputs, most of which are procured from national markets. Thus the location decision in manufacturing in general appears to be independent of the location of raw materials.

Similarly, Vleugels (1990) reports that for plants located in the Central-region, the main source of inputs is Mexico City, followed by regional sources. Local sources of inputs are also the least important according to this study. The “border location factor” which dominates the ranking of factors for the maquiladoras (Quintanilla 1991), as well as some components of the “producing-for-export” factor, which is an important influence in the decision to locate an auto-plant in North Mexico (Ramírez 1995), also reflect the relevance of a network of suppliers of industrial inputs located within North Mexico and/or the U.S., but not necessarily in the city or state where the plant is located. This sort of “footlooseness” exhibited by an increasing number of manufacturing operations, to some extent, can be explained by the relative unimportance of transport costs— in 80 percent of the plants surveyed by Garza, transport costs (of inputs or outputs) represented less than 5 percent of total costs.

<sup>30</sup> Vázquez and García (1992) report that six plants supplying auto-parts to Ford were established subsequently in the same industrial park in the City of Hermosillo (State of Sonora). The production of these plants is exclusively sold to Ford. Moreover, the implementation of projects for expansions and establishment of new export-plants in other industries such as computers, food and beverages, and cement is also taking place in nearby sites, the same source reports. Ford’s export-plant accounted for 62 and 55 percent of the State of Sonora’s exports in 1988 and 1989, respectively.

*Labor-related Factors.* Local availability of labor and the “labor climate” (i.e., unionization rates, union activity, and turnover rates), as Garza’s study reveals, are important location criteria (second only to local infrastructure) whereas wages and skills-qualifications are of moderate and moderate-to-low importance, respectively. Here, small plants play down the importance of the “labor climate” whereas large plants play up the role of labor costs in the locational choice. The moderate importance of the wage level can be explained, to some extent, by the fact that labor costs represent, at best, a moderate proportion of total costs— labor costs are less than 20 percent of total costs in 74 percent of the plants surveyed in Garza’s study.

Among the maquiladoras, both local “labor climate” and the availability of professionals and skilled workers are very important for the decision to locate in a particular border city (Quintanilla 1991). The study by Galbraith *et al.* reports that for the maquiladoras’ *regional search* (Tijuana-Tecáte area), an adequate supply of management staff, technicians, and skilled workers, in that order, are the highest-rated location criteria.

The econometric evidence is somewhat consistent with the at best moderate importance of labor costs supported by survey studies. For instance, Tamayo (1996) shows that during 1970-1980, contrary to conventional expectations, there was a tendency for manufacturing output (thirteen of nineteen industries) to expand the most in high-wage states, which was particularly strong for industrial chemicals, automobiles, and primary metals. The explanation of such results is that high wages may reflect, at least in part, the availability of labor force characteristics appreciated by businesses (e.g., dependability and specialized skills) in states that, for other reasons, are relatively more attractive for production.<sup>31</sup>

For the second period only the few industries that underwent a drastic restructuring toward export-markets during the 1980s such as automobiles, electronic equipment, and machinery & equipment, again experienced growth and also tended to increase production the most in high-wage states, just as in the previous period.<sup>32</sup>

<sup>31</sup> As noted by the author, positive wage coefficients could result if the model does not control at all for labor productivity or if the measure of labor productivity does not control adequately for interregional differentials in that factor (i.e., the wage-coefficients pick-up the effect of labor productivity). That is, in order to evaluate the impact of wages on output growth, it is necessary to control for labor productivity as firms do not seek low-wage locations but rather locations where wages are low relative to productivity. Nevertheless, the study (Tamayo 1996) tried two different measures of inherent labor productivity but the wage coefficients remained virtually unchanged.

<sup>32</sup> In contrast, eight of nineteen industries were insensitive to inter-state wage differences; several others showed a tendency to contract output the most in (or to avoid) high-wage states. However, as most of these industries actually experienced negative growth the corresponding results can not be used to make inferences about the determinants of industry growth.

In agreement with the low importance of labor skill-qualifications evidenced through survey studies, Tamayo (1996) reports that manufacturing output growth in all nineteen industries was insensitive to inter-state differentials in labor productivity in both periods (two alternative measures related to the level of education of the working age population were used as a proxy, but results were the same). An explanation of this result is that the traditional routinization and low-skill requirements of most industrial tasks in the typical Mexican manufacturing system enable firms to find an adequate supply of labor in virtually every major urban area. Even the new generation of high-tech plants in the automobile and electronics industries have progressively reduced the minimum years of schooling required for hiring, as reported in Shaiken (1994).<sup>33</sup> Hence, the decision as to where to increase production becomes indifferent to inter-state differentials in the level of education of the work force.

A study based on qualitative interviews analyzing Mexico's potential as a host for high-tech automobile and electronics plants (Shaiken 1994, p. 4) reports that medium-sized northern cities with no strong industrial tradition were chosen as potential locations, whereas important industrial cities also within the north such as Monterrey and Saltillo were excluded<sup>34</sup> as "managers...were searching for workers with weak or no preconceptions about industrial organization and for either no unions or compliant unions that would play small roles on the shop floor". It should be noted, however, that the emphasis on relatively inexperienced workers and weak unions, even at the cost of extensive on-site training programs, was driven by the firms' technological strategies regarding the introduction of high-tech flexible production systems (see footnote 9). A central objective of the study by Ramírez (1995) is precisely to subject the presumed importance for the auto-plants' location decision, of conditions favorable to the application of flexible production technologies, to the data and statistical tests. These conditions involving labor-related factors such as the availability of non-union labor and polyvalent workers (multiskill workers who perform different functions within a given production area), and flexible contracts, were synthesized in a composite variable called "application of just-in-time systems." The results show that such variable has the strongest effect on the decision to locate an auto-plant in North Mexico. In contrast, such a decision

<sup>33</sup> That study reports that about a third of the initial workforce at Ford's assembly and stamping complex in northern Mexico had some professional or university training, but the plant now targets high-school or even junior-high graduates. Reportedly, this is part of a strategy aimed at reducing turnover rates. A large Japanese high-tech auto-plant even recruits workers with no more than primary school education, and about 50 percent of the workers in a Japanese electronics plant have only primary school completed.

<sup>34</sup> The regional search or why they choose northern Mexico as opposed to regions further south in the country is not addressed in that study. Rather it focuses on the characteristics making Mexico attractive as location of high-tech plants as well as on the assessment of Mexico's long-term potential for high-tech production.

is negatively correlated with the composite variable "supply of traditional labor force" which incorporates factors such as the availability of labor force with traditional qualifications (high specialization to perform a routine), engineers, technicians, and formal training centers. This negative relationship, arguably, only reflects the low importance given by corporate managers to the worker's traditional qualifications as these qualifications are not necessary to create polyvalent workers. In short, appropriate conditions for the "application of just-in-time systems" is the decisive locational factor, the study concludes. Otherwise, these high-tech automobile plants had chosen northern cities with a long industrial tradition such as Monterrey or Saltillo rather than the vicinity of mid-sized cities with a relatively weak industrial sector.

*Infrastructure and Other Public Policy Factors.* Regardless of plant size, the availability of local infrastructure is the highest-rated locational factor, with transportation facilities as an important factor as well, according to Garza's study which covers a group of locations dispersed across several regions.<sup>35</sup> Similarly, Galbraith *et al.* (1990) and Quintanilla (1991) report that for the maquiladoras' locational choice the provision of infrastructure at the state/local level (e.g., availability of transportation, energy, and water for industrial use) as well as at the site-specific level (e.g., urban public transportation, proximity of highways and housing, and existence of an industrial park) is an important factor (although not as important as personnel-related factors, which can be understood given the average maquiladora's labor-intensive operations).

The study by Galbraith *et al.* also reveals that the lack of reliable public services (utilities) and shipping have become a great concern for the maquiladoras in the Tijuana-Tecate area. Similarly, Quintanilla shows that the main problems currently faced by maquiladoras located in Tamaulipas' three border cities, as ranked by their managers, are the deficient urban infrastructure (e.g., water shortages, deteriorated and congested traffic routes, etc.) and public transportation system.

Regarding fiscal incentives, Vleugels (1990) reports that federal fiscal incentives offered as part of industrial deconcentration programs (see section on these federal programs above) together with local and state incentives (e.g., tax advantages and donation of land) were the second most important location factor in the Central region—i.e., the immediate area of influence of Mexico City. In contrast, an analysis of the regional search, covering a much wider part of the country (Garza 1992) found that, overall, government support programs (broadly defined) have had, at best, a moderate importance. The ineffectual role of fiscal and

<sup>35</sup> In that study, infrastructure includes the provision of power, fuels, water and other public utilities not clearly described in the text. Services functional to the operation of manufacturing businesses such as banking and those offered by business organizations were of moderate and very low importance, respectively, for the location decision.

credit incentives aimed at promoting deconcentration has also been documented for other important Latin American economies.<sup>36</sup>

The econometric evidence, in general, seems to be consistent with the preceding results. Ramírez (1996) found that "traditional or weberian factors," a composite variable synthesizing a set of locational factors such as existing public infrastructure, federal and state government incentives (e.g., preferential loans, tax exemptions, free land, fuel distribution systems) are not determining for the decision to locate an auto-plant in North Mexico. As noted by the author, such a result does not mean that the factors incorporated into that composite variable have no importance whatsoever for the location choice at the regional level, but rather that their importance is conditioned and subordinated to the existence of other factors. Furthermore, Ramírez argues (based on qualitative information) that these public policy factors actually had a considerable effect on the location decision at the site-specific level (i.e., once the decision to locate within the North was made and the number of potential sites reduced).<sup>37</sup> In general, the effect of tax variables on the location choice is likely to increase as the size of the area over which the site-specific search takes place decreases. This is so because inter-site costs and market differentials usually decrease as the size of the area wherein the potential sites selected are located decreases (Wasylenko 1981, p. 61). However, given the magnitude of the federally-funded provision of infrastructure, it is questionable whether the state-level might have had a significant influence on the location decision incentives (see footnote 37). In other words, it is reasonable to contend that the Ford plant would have been located in Hermosillo anyway, with or without the state government incentives. Nevertheless, there is no reason for businesses to turn down additional incentives even if such incentives are not decisive for the location choice.

<sup>36</sup> With the reservation of relying on a small sample of plants, Boneo (1985) suggests that despite the significant fiscal incentives granted in Argentina's lagging regions throughout the period 1970-1982, location within the Metropolitan Area of Buenos Aires was preferred by owners/managers mostly because of their personal preferences for Metropolitan living and their misconceptions about presumed disadvantages in the lagging regions (e.g., lack of labor force discipline and skills and poor service infrastructure). Unpredictable and frequent changes in the regime of fiscal incentives, reportedly, was also a factor favoring location in Greater Buenos Aires.

<sup>37</sup> Federal and state incentives, Ramírez argues, were determining for the firms to choose a specific site within the North. In order to ensure the location of the Ford-plant in Hermosillo, the federal government built a 350km-gas pipeline, streamlined the seaport of Guaymas to facilitate shipping among Mexico, US, and Japan and, in 1984, released a loan accounting for one-tenth of the plant total value. Likewise, federal money was used to streamline two industrial estates in Chihuahua City and Ramos Arizpe, and to built a gas pipeline to supply the second city. He contends also that the competition between the state governments of Chihuahua and Sonora for hosting the Ford-plant, was decided in favor of the latter largely because of a superior package of incentives including tax exemptions, rebates in the price of water and power, free land, and creation of roads and telecommunicatio infrastructure.

Tamayo (1996) reports that, during the 1970-1980 period, public investment in communications and transport infrastructure, which merely reflects a short-term policy, stimulated output growth in only five of the nineteen industries studied (i.e., industrial chemicals, automobiles, machinery & equipment, apparel & knitting, and wood products). Most industries appeared to be insensitive to inter-state differentials in that type of investment. Thus, it seems that it is the stock of public capital, which reflects the long-run investment policy (rather than current investment) that enhances the attractiveness of a particular region for manufacturing production. Another result of that study is that, contrary to conventional expectations, most industries have not avoided states with a relatively high business tax-effort (a few of these industries even showed a tendency to expand the most in states with a relatively high business tax-effort).<sup>38</sup> As contended by the author, forward shifting to consumers is a plausible explanation given the high levels of trade protection and the oligopolistic structure of the Mexican economy throughout the period of analysis, 1970-1980, particularly in intermediate and capital goods. Another possibility is that inter-state variations in the provision of public services functional to industrial activities cancel out inter-state variations in business tax-effort, which makes the expansion of industry indifferent to the latter. Higher taxes on business should not discourage industry growth, provided that businesses are compensated somehow for the tax differential they pay.

*On the Push Factors Inducing Deconcentration.* It has been reported that the number of branch plants established by Mexico City-based firms in Central-region industrial estates as well as the number of relocations of single-plant firms from Mexico City to these sites has been considerable, relative to local start-ups (Vleugels 1990). However, the proportion of plants moving away from Mexico City declines with increased distance, relative to the total sample at each site (which also includes local start-ups, intra-region relocations, and interregional relocations other than from Mexico City). The proportion of branch plants declines faster than that of single-plant relocations. In contrast, local start-ups become more important with increased distance. Likewise, Aguilar (1993) provides evidence that a high proportion of the plants moving out of Mexico City is established within the Central region.<sup>39</sup>

<sup>38</sup> In that study, the business tax-effort variable measures how much the potential tax base of a particular state is actually exploited relative to the other states. It takes into account the regionally differentiated system of tax credits (see section on deconcentration policies above) as well as any other tax concession (given against business income taxes) which is not homogeneous across states. It also assumes that the tax collection system of the different states has a similar efficiency, but as the author notes, the use of the statutory federal income tax rate on business as independent variable would have no impact on regional industry growth as it is homogeneous across states.

<sup>39</sup> Reportedly, almost one-third of the surveyed plants relocated within Mexico City's most immediate area of influence, and more than 80 percent within the adjacent states. The main focus of that study is on the contribution of industrial parks to the deconcentration of industry from Mexico City. Even though it also deals with the location decision within Central Mexico, the sample of

The lack of adequate space for expansion in Mexico City was ranked first among the reasons for branching and relocation, followed by high rents and land prices, as reported in Vleugels (1990). Aguilar (1993) consistently reports that diseconomies such as lack of space, high land prices, and costs related to the congested traffic are largely responsible for relocations out of Mexico City. By moving production (or expanding production by branching) to these Central-region cities/sites, firms have been able to remain close to their main output market and source of industrial inputs while avoiding the disadvantages of the overcrowded Mexico City area. Their local linkages reportedly are minimal. Hence the relatively immediate access (proximity and good highway connection) to Mexico City's market have become an attractive attribute of Central-region locations once manufacturing activities in Mexico City started to experience diseconomies. A similar deconcentration pattern has been found in São Paulo, Brazil (Townroe 1983), and Seoul, Korea (Kwon 1981).<sup>40</sup>

There is also evidence of maquiladora plant relocations from border sites toward interior localities since the mid-1980s. Wilson (1991) reports a few specific cases of foreign-owned plants relocated from border cities to Monterrey and Guadalajara because of tightening labor markets in the former (e.g., high labor turnover rates, rising wages of skilled workers, and labor shortages).<sup>41</sup> The impressive take off of maquiladora operations since the mid-1980s certainly has already put the border's labor markets and infrastructure capacity under strain. Nevertheless, the increasing number of maquiladoras in interior locations shown in the statistical reports should not be mistaken as new investments with strong foreign participation nor as the consolidation of a new locational pattern of these operations. Relocations from border to interior locations have not affected the dominant share of the former in these operations. As Wilson shows, the increasing share of interior locations in maquiladora operations is largely due to the conversion of domestic producers into maquiladoras (most of the converted-to-maquiladora producers have found a foreign partner and registered under the maquiladora program), which became a relevant alternative to face both the increasing competition from abroad

plants used for that purpose was drawn from only two industrial parks, which make any generalization of results highly unreliable.

<sup>40</sup> According to Townroe (1983), the need for expansion beyond the limits of existing space is the main factor pushing industrial plants out of the overcrowded Metro Area of São Paulo, Brazil. The decision for relocation or branching resulted, in most cases, from the necessity to increase production faced with the problem of a lack of adequate space for expansion at present site. Kwon (1981) observes that cost differentials of land and buildings between Seoul and other locations has forced enterprises to move out of the former, albeit according to official reports, only 10 percent of "relocatable" industries wished to move to locations farther than 30 km. of their present site.

<sup>41</sup> Galbraith *et al.* (1990) estimates a monthly employee turnover rate of 8-10 percent among the electronics maquiladoras in the Tijuana-Tecate area. Other studies report workers' monthly turnover rates for maquiladoras ranging from 10 to 15 percent or even above 15 percent, varying across activities and locations (Pradilla 1991; and González *et al.* 1989).

brought about by the far-reaching trade liberalization and the contraction of the domestic market.

#### ***IV. Some Preliminary Inferences***

Even though no rigorous quantitative evaluation has yet been produced regarding the importance of the factors underlying the increasing interregional imbalances in industrial growth during the stage of national industrialization (1940-1970) in Mexico, the available empirical evidence suggest that remarkable differentials in agglomeration economies and markets (which vary directly with the size of the urban-industrial cluster), supplemented with commensurate differences in the stock of public infrastructure were the chief determinants.<sup>42</sup> Throughout the last 15 to 20 years a process of concentration reversal appears to have gained a foothold, yet the share of the MAMC in national manufacturing still is more than one third. Thus the attraction of industry toward the agglomeration economies and market of the few major metropolitan areas, mainly the MAMC, no doubt remains strong and very likely will continue imposing severe constraints on the range of potential alternatives for industrial location and growth.<sup>43</sup>

Definite conclusions on the relevant factors inducing industrial deconcentration cannot be drawn on the basis of the limited number of studies and their quite dissimilar methodologies and design. This proved to be particularly difficult with respect to public policy variables. Hence, there is a great deal of work to be done before we can assess the extent to which policy intervention can

<sup>42</sup> At the onset of the stage of national industrialization, population, economic activity and hence, income were already concentrated in the MAMC and to a lesser extent, in a few other secondary urban areas. Agglomeration economies and demand in these major cities soon overcame the critical threshold. Thereafter, industrial production became increasingly attracted toward these few advantaged urban areas. Economic and demographic growth in these cities accelerated and their locational advantages *vis-à-vis* the rest of the country widen progressively. The priority assigned to the objective of national industrialization implied that federal investment in physical infrastructure had to be largely allocated in these leading urban-industrial centers, mainly the MAMC, in order to accommodate their dynamic growth. Likewise, the national highway system as well as the energy distribution systems were oriented to support the economic activity of these areas at the expense of the development of vast regions. The tendency of economic activity to locate in the few largest cities became stronger insofar as communications, information about other locations, labor force qualification and physical infrastructure in the rest of the country remained poor.

<sup>43</sup> Compared to developed economies, the attraction of agglomeration economies and market potential offered in the dominant urban centers would be much more difficult to overcome in newly industrializing countries, because of their disjointed city-size distribution characterized by sizable gaps between a dominant urban center and secondary cities, and between the latter and small towns. Governments usually are reluctant to decisively promote deconcentration or interregional equity, as that would imply inefficiencies in the allocation of resources which would hamper national growth. In developing countries it is very difficult to reconcile this trade-off between aggregated efficiency and interregional equity due to the sizable cost differentials across locations.



realistically influence changes in the regional pattern of manufacturing growth. Nevertheless, some preliminary propositions, can be derived from the available evidence.

A safe proposition is that the stock of local infrastructure needed by manufacturing operations has influenced decisively the locational choice regardless of plant size. Thus, it constitutes a very important stimulus for state/local industry growth. Also the pay-offs in terms of stimulating state/local growth are likely to be greater if the additions to the stock of public capital in a particular area address specific infrastructure requirements of private projects with significant propulsive power (i.e., projects that are likely to generate important forward linkages). In contrast, short-term investment policy (i.e., annualized investment in economic infrastructure) across states apparently has no relationship with inter-state industry growth differentials.

This review also reinforces the belief that, as a location or industry growth factor, federal-state fiscal incentives have been important yet secondary only within Central-region states/locations. Its importance unambiguously declines to become moderate at best for most locations outside of the Central region. This declining relevance as distance increases together with the fact that the decisive factors for the decision to locate or relocate in Central-region sites are proximity and good access to the main national market suggests that not even the effectiveness of fiscal incentives within that region is beyond doubt. In any case, its importance seems to be subordinated to the existence of other location attributes, i.e., market potential, labor supply, etc. Moreover, there is some evidence that many industries have not avoided states characterized by high business tax-efforts. Hence, it is plausible to contend that in many cases the decision to locate in Central-region sites would have been made with or without fiscal incentives.

Regarding the factors over which the government has no control, one of the safest propositions is that good access to important national markets is a quite powerful stimulus for state/local manufacturing growth. A great deal of the observed inter-area differentials in manufacturing growth is explained by inter-area differences in access to markets. Hence, industrial growth in Central-region locations has been stimulated importantly by their proximity and good connection to the main national market, the MAMC. Likewise, access to national markets still explains, to a large extent, the dominant yet declining share of the MAMC in manufacturing. Some prominent locations within the Central-west and Central-north states have also experienced above average manufacturing growth due to their strategic position (within the national highway system) to serve the MAMC and other important national markets as well. This tendency of manufacturing production to expand most in areas of high market potential appears to be stronger for durable and intermediate goods industries than for consumer goods.

On the other hand, it is clear that the importance of (domestic) market potential for manufacturing growth was significantly undermined throughout the 1980s. Hence the slow-down of manufacturing growth in the Capital and most of the Central-region states (the Capital region experienced negative growth in manufacturing value added between 1980 and 1988). Simultaneously, this review provides some support for the proposition that access to export-markets, mainly in the U.S., has become an increasingly important factor for manufacturing growth since the mid-1980s. The swift structural reorientation of important industries toward export-markets, coupled in some cases with the severe contraction of the domestic market, produced a commensurate northward shift of manufacturing growth. In addition, the number and output of maquiladoras, whose production is almost totally shipped back to the U.S., has also shown a quite impressive growth across border cities since the mid-1980s. The advantages of northern locations in terms of facilitating access to the U.S. market *vis-à-vis* alternative locations down into Mexico have been quite attractive for relocations and installation of new export-capacity.<sup>44</sup> Hence, inter-area differentials in access to export-markets seem to account for a great deal of inter-area differentials in industry growth. In the particular case of plants using flexible production systems, the proximity to the U.S. market and parent firms, as a location factor and determinant of industry growth appears to be conditioned by the existence of other regional attributes, notably a more propitious labor climate. The establishment of these large plants, mostly in automobiles and electronics, has had further positive effects on local industry growth as they have attracted important suppliers and contributed to improve the attractiveness of the locality for a diversity of industries.

There is also support for the proposition that state/local markets, in general, are considerably less important as determinants of inter-area industry growth. Likewise, state/local input sources are, at best, of moderate importance. Nevertheless, the importance of these factors varies inversely with plant size—they are crucial for very small plants. A final plausible proposition based on this review is that local availability of labor and a favorable “labor climate,” in general, are an important stimulus for industry growth. The “labor climate” is less influential among small plants though. In contrast, industry growth across areas appears to be insensitive to inter-area differentials in the level of education of the working-age population (as a proxy for labor productivity). Likewise, the qualifications of the

<sup>44</sup> The most visible and analyzed case is the terminal auto-industry, whose installation of new and expansion of existing export-capacity (engines and vehicles) in the North has been part of changes in corporate sourcing strategies to improve competitiveness in the U.S. market. But the consumer electronics industry, traditionally oriented toward the domestic market and largely dependent on imports, also implemented a far-reaching reorientation toward export-production since the mid-1980s, forced by the increasing foreign competition and the government's balance of payments requirements. This industry relocated from the MAMC toward northern border cities and reorganized as export-maquiladoras.

local work force appears to have only a moderate-to-low positive impact on industry growth. According to the available evidence, high wages do not deter industry growth—the conventionally expected negative impact of labor costs is moderate at best.

Some policy implications dealing with the effectiveness of and constraints on state intervention aimed at enhancing industrial growth potential in particular areas can be drawn from this review. First, it is very likely that the effect of fiscal policies for industrial promotion in lagging or less developed regions will be offset by the still powerful attraction of most industries toward states with high market potential in which the largest urban-industrial areas are located. Despite the declining influence of market potential on regional industrial growth throughout the 1980s, it is very likely that this tendency will regain strength in subsequent periods of growth. The visible locational shift of the auto-industry toward the north (and away from the large national markets) was driven by changes in the global sourcing strategy of U.S. corporations (which control a large part of that industry) aimed at improving their competitiveness in the U.S. market. Most other manufacturing industries are likely to remain largely oriented toward the domestic market insofar as they have a low export-propensity and much less involvement of foreign subsidiaries. In short, the effect of any reallocation of public resources toward deconcentration will be constrained by this inertia toward concentration in the largest urban-industrial areas characterized by a high market potential and important agglomeration economies.

A critical issue that must be considered when implementing regional policy is the trade-off between aggregate efficiency and interregional equity. As observed by Richardson (1981), regional policies aimed at deconcentrating economic activity may well retard national growth and development if introduced too early. The positive relationship between increasing primacy (i.e., excessive concentration of economic activity and demography in a leading national center) and faster economic growth is well known. In other words, high levels of primacy are critical in certain stages of economic development. On the other hand, it is not an easy task either to determine when the concentration of economic activity at the core region/primate city has reached levels that are detrimental to national economic growth. Moreover, this trade-off between aggregated efficiency and interregional equity is very difficult to reconcile in developing countries, to the extent that comparative costs vary widely across locations, access to markets is very low outside of the core region, and the supply of infrastructure is quite inadequate (Richardson and Townroe 1986).

Consistency and complementarity of regional policy with macro and sectoral policies is a critical issue as well. Regional policy instruments are often weak compared with macro and sectoral policy instruments, and the latter frequently have implicit unintended spatial outcomes that conflict with the objectives of the former. In Mexico, for instance, import-substitution policies contributed to the concentration of economic activity as protection stimulated those industries which (because of

their own production characteristics) were already located, mostly or exclusively, in the MAMC, the only sizable national market (Ten Kate 1980). No doubt, this contributed greatly to neutralize the impact of the deconcentration policies implemented during the 1970s.

Thus, the introduction of a policy to promote deconcentration of industrial growth is more likely to succeed when it is consistent with macro and sectoral policies, on the one hand, and more justifiable when market forces have already started to induce some deconcentration, on the other hand. Manufacturing activity in Mexico is shifting away from the MAMC and largely toward the northern and some central states. The shift toward the north has been particularly pronounced and, apparently, it continues up to the present. Automobiles, machinery & equipment, and electronic equipment, all three industries with a high export-propensity, are the most significant cases of that northward movement. This deconcentration trend has taken place despite the lack of a solid public policy aimed at that objective and, to some extent, because of macro and sectoral policies introduced since the mid-1980s as a key component of an export-led development strategy consolidated with the activation of the North American Free Trade Agreement.

Within this context, an explicit regional policy to further enhance the growth potential of selected areas in north and central Mexico, largely through investments in economic infrastructure, can be consistent and complementary with the export-oriented macro and sectoral policies currently in place. This policy can also contribute to national economic growth insofar as the additions to the stock of public capital would further improve the efficiency of the ongoing interregional reallocation of private resources. The pronounced shift of production toward north and, to a lesser extent, central Mexico suggests that industry is operating there with at least the same level of efficiency as in the traditional industrial areas. Nevertheless, in order to maintain that level of efficiency in the recipient areas as industry continues growing there at rapid rates, it may be necessary to enlarge the positive externalities and scale economies that firms can realize there through further improvements to their economic infrastructure. This may both facilitate an accelerated growth in these areas and raise national growth.

In short, the point to emphasize is that there is an opportunity to integrate active industrial deconcentration policies into the general economic development strategy without obstructing but rather enhancing national economic growth and without counteracting but rather supporting and complementing macro and sectoral policies.

It may appear that such policy alternative would be at the expense of enlarging the economic disparities between areas of intermediate development in central and north Mexico, on one hand, and the lagging southern regions, on the other —which runs contrary to the explicit objective of regional policy. Nevertheless, this issue dealing with the trade-off between aggregated growth and

equity among peripheral regions can be best approached by concentrating the allocation of investment in economic infrastructure in regions/areas of intermediate development, as proposed here, and the allocation of investment in social infrastructure among lagging regions. Using precisely the case of Mexico, Looney and Frederiksen (1981) provide econometric evidence that economic infrastructure explains a great deal of the economic growth differentials among regions of intermediate development, whereas its effect is insignificant among lagging regions. The opposite occurred with social infrastructure. Thus, provided that investment in social infrastructure is preferentially allocated in lagging regions, concentrating the allocation of investment in economic infrastructure in these areas of intermediate development toward which industry is already shifting would also be consistent with both national growth and equity among peripheral regions —i.e., regions outside of the highly congested areas.

## **Bibliography**

- Aguilar , Ismael (1993). *Descentralización Industrial y Desarrollo Regional en México: Una Evaluación del Programa de Parques y Ciudades Industriales 1976-1986*. El Colegio de México, Mexico DF.
- Alonso, William (1975). Industrial Location and Regional Policy In Economic Development, in John Friedmann and William Alonso (eds.), *Regional Policy: Readings in Theory and Applications*. The MIT Press, Cambridge.
- Bassols, Angel (1979). *México: Formación de Regiones Económicas*. Instituto de Investigaciones Económicas, Universidad Nacional Autónoma de México, Mexico DF.
- Beeson, Patricia E., and Randall W. Eberts (1989). Identifying Productivity and Amenity Effects in Interurban Wage Differentials, *The Review of Economics and Statistics* 73:3.
- Boneo, Horacio (1985). *Desarrollo Regional, Incentivos Fiscales y Localización Industrial*. Centro de Estudios de Estado y Sociedad (CEDES), Buenos Aires.
- Brown, Arthur J., and E. M. Burrows (1977). *Regional Economic Problems*. Allen & Unwin, Great Britain.
- Bustamante L., Carlos (1983). *Urban Concentration and Policies for Decentralization in Mexico 1976-1982*. Instituto de Investigaciones Económicas, Universidad Nacional Autónoma de México, Mexico DF.
- Cabrero, Enrique (1997). *El Impacto Regional de las Políticas Descentralizadoras. Análisis de desequilibrios regionales, gasto e ingreso público y relaciones intergubernamentales 1983-1993*, Unpublished Paper, Centro de Investigación y Docencia Económicas, Mexico DF.
- Eberts, Randall W. (1991). Some Empirical Evidence on the Linkage Between Public Infrastructure and Local Economic Development, in Henry W. Herzog Jr. and Alan M. Schlottmann (eds.), *Industry Location and Public Policy*. The University of Tennessee Press, Knoxville.
- Friedmann, John R. (1966). *Regional Development Policy: A Case Study of Venezuela*. The MIT Press, Cambridge.
- Galbraith, Craig S., Alex F. De Noble, and Paul Estavillo (1990). Location Criteria and Perception of Regional Business Climate: A Study of Mexican and U.S. Small Electronic Firms, *Journal of Small Business Management* 28:4.
- Garza, Gustavo (1992). *Desconcentración, Tecnología y Localización Industrial en México: Los Parques Industriales 1953-1988*. El Colegio de México, Mexico DF.
- \_\_\_\_\_ (1983). *El Proceso de Industrialización en la Ciudad de México (1821-1970)*. El Colegio de México, Mexico DF.
- Gerking, Shelby, and William Morgan (1991). Measuring the Effects of Industrial Location and State Economic Development Policy: A Survey, in Henry W. Herzog Jr. and Alan M. Schlottmann (eds.), *Industry Location and Public Policy*. The University of Tennessee Press, Knoxville.
- González B., and J. Ramírez (1989). Perspectivas Estructurales de la Industria Maquiladora, *Comercio Exterior* 39, Mexico DF.

- Greenwood, Michael J. (1978). An Econometric Model of Internal Migration and Regional Economic Growth in Mexico, *Journal of Regional Science* 18:1.
- Hernández Laos, Enrique (1985). *La Productividad y el Desarrollo Industrial en México*. Fondo de Cultura Económica, Mexico DF.
- Kwon, Wong-Yong (1981). A Study of the Economic Impact of Industrial Relocation: The Case of Seoul, *Urban Studies* 18:1.
- Lamartine-Yates, Paul (1960). *El Desarrollo Regional de México*. Banco de México, Mexico DF.
- Lavell, A. M. (1972). Regional Industrialization in Mexico: Some Policy Considerations, *Regional Studies* 6.
- Lees, Norman D. (1965). *Localización de Industrias en México*. Banco de México, Mexico DF.
- Looney, Robert, and Peter Frederiksen (1981). The Regional Impact of Infrastructure Investment in Mexico, *Regional Studies* 15:4.
- López Malo, Ernesto (1960). *Ensayo Sobre la Localización de la Industria en México*. Universidad Nacional Autónoma de México, Mexico DF.
- Markusen, Ann R. (1991). Government As Market: Industrial Location in the U.S. Defense Industry, in Henry W. Herzog Jr. and Alan M. Schlottmann (eds.), *Industry Location and Public Policy*. The University of Tennessee Press, Knoxville.
- Newman, Robert J., and Dennis H. Sullivan (1988). Econometric Analysis of Business Tax Impacts on Industrial Location: What Do We Know and How Do We Know It?, *Journal of Urban Economics* 23:2.
- Palacios, J. José (1989). *La Política Regional en México, 1970-1982*. Universidad de Guadalajara, Guadalajara Mexico.
- Pradilla, E. (1991). Las Fronteras de la Maquila, in *La Reconversión Industrial en Colombia y Otras Experiencias*. Universidad Nacional de Colombia - Fundación Friedrich Ebert, Bogotá.
- Quintanilla, Ernesto (1991). Tendencias Recientes de la Localización de la Industria Maquiladora, *Comercio Exterior* 41:9, Mexico DF.
- Ramírez, José C. (1995). *La Organización Justo A Tiempo en la Industria Automotriz del Norte de México. Nuevos Patrones de Localización y Eficiencia*, Centro de Investigación y Docencia Económica (Documento de Trabajo), Mexico DF.
- Richardson, Harry W. (1981). National Urban Development Strategies in Developing Countries, *Urban Studies* 18:3.
- Richardson, Harry W. and Peter M. Townroe (1986). Regional Policies in Developing Countries, in Peter Nijkamp (de.), *Handbook of Regional and Urban Economics* Vol. I. North Holland, The Netherlands.
- Sabel, Charles F. (1989). Flexible Specialisation and the Re-emergence of Regional Economies, in Paul Hirst and Jonathan Zeitlin (eds.), *Reversing Industrial Decline? Industrial Structure and Policy in Britain and Her Competitors*, Berg, Oxford.
- Schoenberger, Erica (1987). Technological and Organizational Change in Automobile Production: Spatial Implications, *Regional Studies* 21:3.
- Shaiken, Harvey (1994). Advanced Manufacturing and Mexico: A New International Division of Labor?, *Latin American Research Review* 29:2.

- Scott A. J., and M. Storper (1987), High Technology Industry and Regional Development: A Theoretical Critique and Reconstruction, *International Science Review Journal*.
- Tamayo, Rafael (1996). *The Determinants of the Regional Patterns of Manufacturing Growth in Mexico 1970-1988*, Unpublished Doctoral Dissertation, University of Pittsburgh, Pittsburgh.
- Tenkate, Adriaan (1980). Protection, Regional Concentration, and Interregional Distribution of Domestic Product, in Adriaan Tenkate and Robert Bruce Wallace, *Protection and Economic Development in Mexico*. St. Martin's Press, New York.
- Townroe, Peter M. (1983). *Location Factors in the Decentralization of Industry: A Survey of Metropolitan São Paulo Brazil*. World Bank Staff Working Papers No. 517, Washington DC.
- Towse, Raymond J. (1990). *High Technology Industry, Industrialization and Location: A Bibliography and Geographical Review*, VANCE bibliographies, public administration series.
- Unikel, Luis (1976). *El Desarrollo Urbano en México*. El Colegio de México, Mexico DF.
- United Nations Centre on Transnational Corporations, UN-CTC (1992). *Foreign Direct Investment and Industrial Restructuring in Mexico: Government Policy, Corporate Strategies, and Regional Integration*. UNCTC Current Studies, New York.
- Vázquez, Miguel A., and Guadalupe García (1992). *La Modernización Industrial en Sonora*. Gobierno del Estado de Sonora (Mexico), Hermosillo.
- Vleugels, René M. P. (1990). *Industrialization and Secondary Cities in Mexico*. Nijmegen Studies in Development and Cultural Change, Verlag breitenbach Publishers, Fort Lauderdale.
- Wasylenko, Michael (1991). Empirical Evidence on Interregional Business Location Decisions and the Role of Fiscal Incentives in Economic Development, in Henry W. Herzog Jr. and Alan M. Schlottmann (eds.), *Industry Location and Public Policy*. The University of Tennessee Press, Knoxville.
- \_\_\_\_\_ (1981). The Location of Firms: The Role of Taxes and Fiscal Incentives, in Roy Bahl (ed.) *Urban Government Finance: Emerging Trends*. Urban Affairs Annual Review vol. 20.
- Wilson, Patricia A. (1991). *Exports and Local Development: Mexico's New Maquiladoras*. University of Texas Press, Austin.